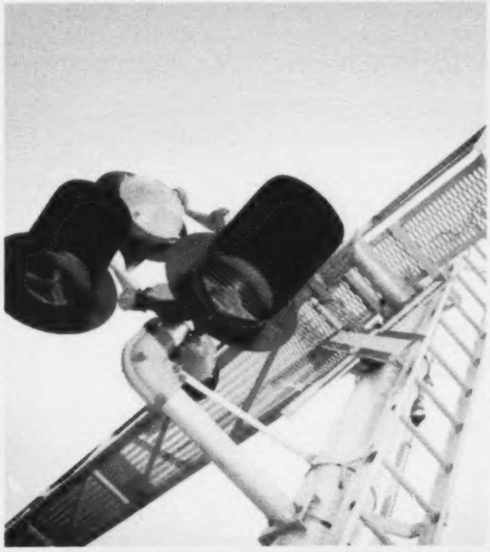
ENHANCING RAIL SAFETY IN CANADA:

Working Together for Safer Communities

The 2018 *Railway Safety Act* Review



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Railway Safety Act Review
Examen de la Loi sur la sécurité ferroviaire

255, rue Albert Street
Ottawa ON K1P 6A9

The Honourable Marc Garneau, PC, MP
Minister of Transport
House of Commons
Ottawa, Ontario
K1A 0A6

Dear Minister:

We, the members of the *Railway Safety Act* Review Panel, are proud to present our Report, entitled, *Enhancing Rail Safety in Canada: Working Together for Safer Communities*.

This Report is the culmination of a year of research, consultations and analyses of Canada's rail safety regime. As members of the Review, we made a conscious and concerted effort to build on the work that has been done over the past decade and to tackle the most difficult and persistent issues affecting rail safety and security.

We hope that the findings and recommendations presented in this Report will contribute to keeping Canada's rail system safe and secure.

Sincerely,

Richard Paton

Richard Paton, Chair
Railway Safety Act Review

Brenda Eaton, Vice-Chair
Railway Safety Act Review

Pauline Quinlan

Pauline Quinlan, Vice-Chair
Railway Safety Act Review

Canada

ENHANCING RAIL SAFETY IN CANADA:

Working Together for Safer Communities

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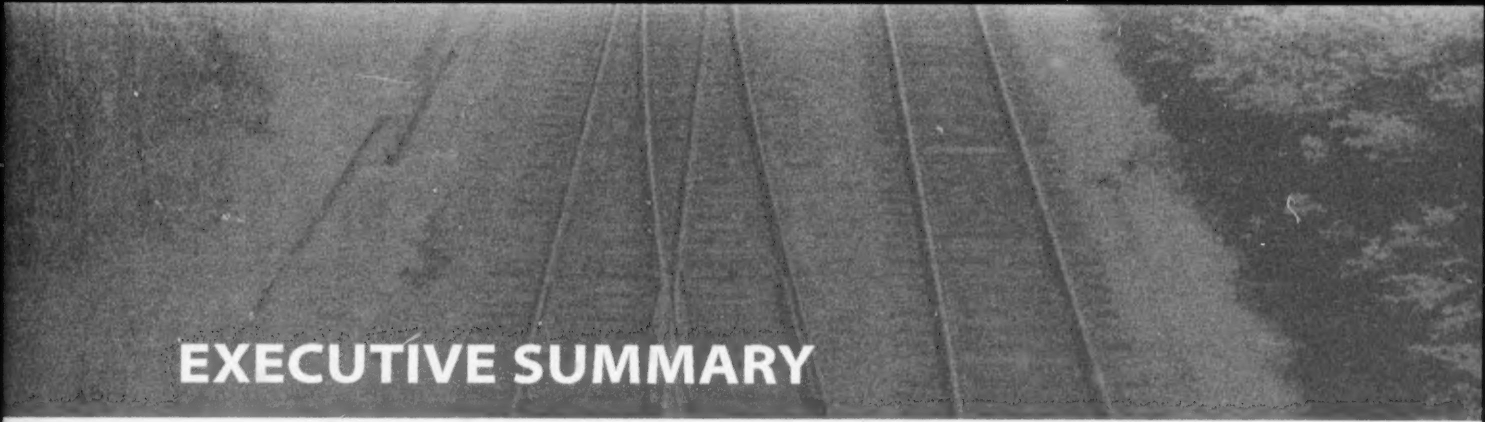
A WORD OF THANKS

This Review could not have been completed without the hard work and dedication of the people who participated. We would like to extend our thanks and appreciation to those who took the time to meet with us to present their views, send us their submissions, and participate in the discussion via our online consultation portal.

By sharing your concerns and ideas on how to improve the rail safety regime in Canada, you helped us to focus on key issues and informed the analysis and discussions that took place throughout the process.

We would like to give special acknowledgement to those who travelled to attend our roundtable sessions across Canada, taking time out of their busy schedules to contribute to our efforts. As well, the guidance provided by Greg Wilkinson (Earnscliffe Strategy Group) and Marcel Proulx (Research and Planning Inc.) on the structure and results of the roundtables, along with their skillful facilitation at the sessions themselves, was instrumental.

The resulting perspectives and concrete suggestions that emerged during those discussions were invaluable and helped shape our findings and recommendations.



EXECUTIVE SUMMARY

Since the last *Railway Safety Act* Review in 2007, many changes have occurred in the railway industry and at Transport Canada, including the legislative changes recommended by that Review and the many other changes to regulations and requirements in the wake of the tragic Lac-Mégantic accident. As a result, the rail safety regime is now very robust in meeting its ongoing compliance monitoring and enforcement functions. However, the current rail safety regime is not sufficient to address persistent issues and the evolving challenges and opportunities for safety in the near future.

Based on the mandate of this Review, a prime focus was to assess any gaps in the rail safety regime and issues where progress had been limited or incomplete. Many of the submissions and the roundtable sessions focused on continuing issues, a number of which were identified in the 2007 *Railway Safety Act* Review (2007 RSA Review) Report, as well as subsequent Transportation Safety Board of Canada investigations. We decided to call these "persistent issues." A major theme of this Review is the requirement for Transport Canada, as well as the railway companies (railways) and other governments, to address these issues.

The safety of the rail system has improved in the last 5 to 10 years, particularly in the area of main track derailments, which have the greatest potential to cause devastating environmental damage and loss of human life. Due to a sustained focus on inspections, compliance and enforcement, as well as technological improvements and investments in rail infrastructure, main track derailments caused by equipment or track failures have been on the decrease. It is expected that with the railways' continued investments in infrastructure and Transport Canada's more robust compliance monitoring and enforcement regime, this trend will continue.

The challenge now and into the future is for Transport Canada to develop a robust, agile and effective rail safety regime that can deal effectively with persistent issues that have been difficult to address. In addition, Transport Canada will need to adapt its role and capacities within its rail safety program to respond to the future challenges brought about by the trends of increased urbanization and unprecedented technological change and, with them, significant changes in the way we live and work.

In order to provide a solid foundation for our assessment of the rail safety regime, the Panel reviewed the experiences of other safety-critical sectors and the work of safety experts. We concluded that there are three fundamental elements of an effective rail safety regime: (i) compliance with technical regulations and standards; (ii) safety management systems; and (iii) safety culture.

Our assessment is that Transport Canada has done a good job of addressing its core rail safety compliance and enforcement functions, and should continue to strengthen its capacity and practices to ensure the rail system is safe in Canada.

With respect to the other two dimensions of rail safety, the work on safety management systems (SMS) is ongoing and still needs improvement as the Department implements the 2015 SMS regulations. Despite some progress by railways in developing a safety culture, there is little capacity or focus on this element of safety within Transport Canada's Rail Safety Program. The Panel has concluded that progress in safety culture by both railways and the Department is essential for continuous improvement to the rail safety regime, particularly with respect to human and organizational performance.

After reviewing the *Railway Safety Act* and the changes that have been made since the 2007 RSA Review, the Panel has determined that the Act provides the Minister with sufficient provisions and powers to carry out the Government's rail safety mandate. The Review proposes only one major change and a number of minor changes for clarity and efficiency.

The major change proposed to the Act involves the issue of the close proximity of residential and commercial land developments to rail operations. This is a significant area of shared responsibility between the federal government, other levels of government and railway companies, among others. A change in this area was recommended in 2007, but not implemented due to jurisdictional concerns.

This Review has assessed these jurisdictional issues, including a legal opinion on the matter sought by the Railway Association of Canada that was submitted to the Review. We concluded that the federal government can require municipalities to provide notification of land development within 300 metres and regulate land use within 30 metres of rail operations. With this legal foundation and the appropriate regulations, it is expected this will provide a basis for improved collaboration with provinces/territories, municipalities and railways on these important proximity issues that are impacting on safety.

In the next 10 years and beyond, the rail safety regime will face both challenges and opportunities in areas such as technology, business practices, urbanization, community involvement and human factors that will challenge Transport Canada's role in the rail safety regime.

Compliance with existing regulatory requirements will not be enough to adapt and adjust to the fast-changing realities of the railway industry, or to take advantage of opportunities in areas like technology. It is expected that the safety challenges of the future will require the Department and railways to work together with improved information to assess risks and engage staff to manage risks, while ensuring continuous improvement in best practices.

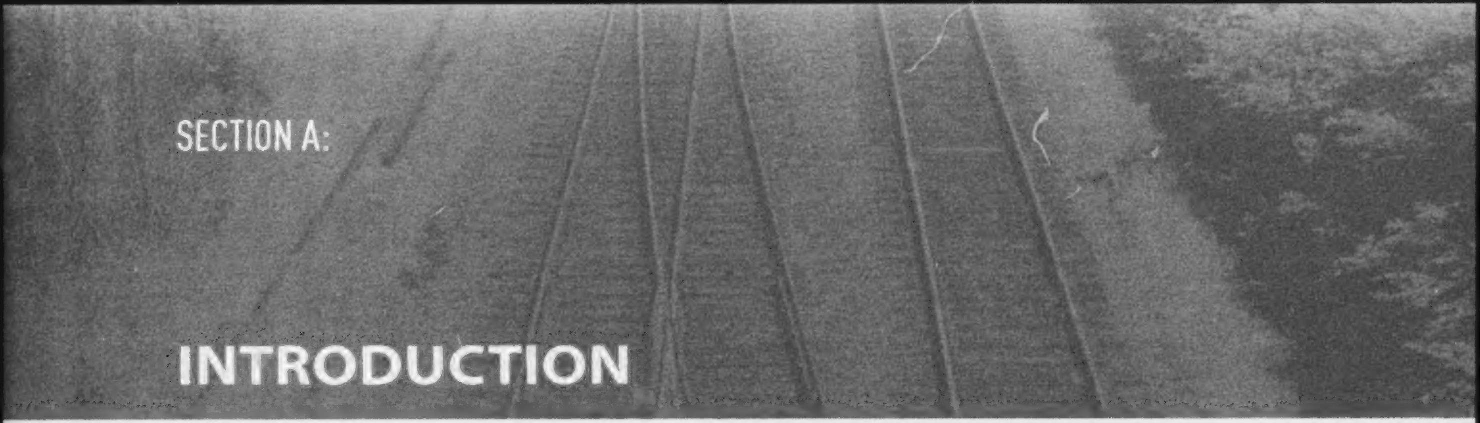
This Report focuses on what Transport Canada needs to do to address the serious and persistent rail safety issues that have not been resolved since the 2007 RSA Review, and to tackle the changing safety challenges and opportunities of the future.

To ensure that Canada maintains a strong and resilient rail safety regime, Transport Canada's rail safety program needs to strategically transform its role and capacity. This includes:

- building a more robust rail safety regime that fully addresses all three critical elements of a sustainable safety regime, including: the integration of safety management systems into the overall risk management approach; and developing greater expertise and leadership in the promotion of safety culture;
- recognizing that the next major challenge in enhancing safety will be to address human and organizational performance factors, which will require enhanced departmental expertise in this area and continuous learning;
- developing a better capacity in technology evaluation, data analytics (including predictive analytics), and human behaviour, to better understand the potential of new technologies to improve safety and facilitate their adoption in Canada;
- building a strong national program to address crossing, proximity and trespassing issues, with significant collaboration from municipalities, provinces/territories and railways; and

- developing a vastly improved approach to collaboration recognizing that rail safety is a shared responsibility among governments, railway companies and communities. Part of this direction involves establishing an innovative information platform to help communities understand the rail safety regime, improve engagement and enhance access to relevant information that responds to their concerns.

To achieve a resilient rail safety regime based on continuous improvement, Transport Canada will need to collaborate with railways and other stakeholders to expand its role to include critical leadership, promotion, information and facilitation functions. It will need to broaden the core responsibilities of compliance monitoring and enforcement to include working in partnership with communities, governments and others to address the key challenges of the Canadian rail safety regime of the future.



SECTION A:

INTRODUCTION

Mandate

On April 26, 2017, the Minister of Transport announced the appointment of a Panel to conduct an independent review of the *Railway Safety Act* (the Act) and, by extension, the rail safety framework that governs the federally-regulated rail system.

The *Railway Safety Act* Review Panel, supported by a Secretariat (together referred to as the Review), has carefully implemented its mandate to focus on the effectiveness of the federal rail safety legislative and regulatory framework, the operations of the Act itself, and the degree to which the Act meets its core objective of ensuring rail safety is in the best interest of Canadians. Throughout our work, we kept in mind the recent implementation of comprehensive amendments to the Act that came into force in May 2013 and in June 2015, as well as the changes to the authorities and operation of the Act that were made in the wake of the tragic Lac-Mégantic accident of July 6, 2013.

The Terms of Reference for the 2017-18 *Railway Safety Act* Review can be found in Annex B.

Scope

The Review was tasked with examining all existing provisions of the Act and the suitability, sufficiency, and efficacy of the regulatory framework, rules, and programs that exist under its authority. More broadly, we were asked to determine the degree to which the Act meets its core objective of ensuring rail safety and serving the best interests of Canada and Canadians. We took care to consider the present state of the rail safety regime, as well as its future challenges, reflecting on the ways in which persistent and emerging trends are likely to affect rail transportation in the coming decades.

As part of this Review, we looked at a number of key issues, including (but not limited to):

- trespassing, crossings, and land use close to railways;
- technological change, innovation and leadership;
- rail security, including cyber security;
- safety management systems and safety culture;
- rail safety oversight planning and activities;
- risk-based planning;
- rule-making process;
- role of Transport Canada;
- collaboration between federal, provincial/territorial and municipal governments, and their respective roles and responsibilities in the rail safety regime;
- infrastructure funding;

- transparency, information-sharing and public confidence in the rail safety regime; and
- human and organizational performance, including fatigue management and drug and alcohol use.

The mandate did not include a direct examination of the transportation of dangerous goods by rail, as that issue is covered by the *Transportation of Dangerous Goods Act, 1992*. Nevertheless, concern about the potential impacts of dangerous goods travelling through or near communities was a recurring theme when we consulted with Canadians, provinces/territories, Indigenous groups, municipalities and community groups across the country.

In light of the high level of risk and the potential for serious consequences of a derailment and spill involving dangerous goods, we made every effort to consider where improvements could be made under the Act to manage these risks.

We took care to listen to and acknowledge the concerns that we heard. Consequently, this Report includes observations on issues that are not covered under the Act but nonetheless are important to the overall strength of the rail safety regime.

Given the scope of this Review, not all of the issues brought to our attention have led to recommendations. However, all submissions we received, as well as summaries from our roundtable sessions held across the country, have been made available on Transport Canada's website. Collectively, this material will serve as an important body of reference to inform future work on Canada's rail safety regime by all partners.

Research for this Report was primarily done by the Review Secretariat, and was supplemented by four reports that we commissioned from subject-matter experts (see Annex E). This research helped to build a solid evidence base to draw from when considering the key issues and best way forward.

The Review Process

The Review was organized into four main phases:

1. Overview phase

This phase involved the review of prior reports on rail safety by authoritative bodies, and the changes implemented by Transport Canada in response. We also met with departmental officials and key stakeholders, and undertook several site visits to railway facilities to better understand how the rail system operates.

During this phase, we published our Consultation Guidance Document online to help frame discussions with a wide array of stakeholders, and to provide insight into the questions and issues that we were exploring.

2. Research phase

In this second phase, we began to actively research the most persistent issues that had been identified during our discussions with stakeholders. We were focused on understanding why some issues seem to be so difficult to tackle, and exploring what could be done to help address them. The submissions we received during this phase and our ongoing discussions with stakeholders provided a rich source of insight and helped us refine our research.

As part of our research, members of the Review attended two international conferences on rail safety, including one with a focus on the importance of developing a strong safety culture. This provided us with insights into how recognized global leaders in safety have continued to improve safety performance beyond traditional approaches.

Once our initial research was complete, we had a firm grasp of key and persistent issues in rail safety and were able to identify the areas that would likely have the greatest potential for tangible improvement within the rail safety regime. This provided the foundation for the consultation phase.

3. Consultation phase

The consultation phase included roundtable sessions in five regions across the country: Montreal, Dartmouth, Vancouver, Calgary, and Toronto. Two roundtable sessions were held at each location. The first roundtable was aimed at identifying key rail safety issues particular to a given region or regions, or that have disparate impacts, due to regional characteristics or circumstances. The second roundtable was national in scope and focused on one of five specific themes identified during the course of our research. Discussion at these roundtable sessions was framed to help identify potential solutions and creative approaches to address long-standing rail safety issues. The themes discussed were:

a. proximity (crossings, trespassing and land use around rail operations);

b. fitness for duty (fatigue, training, distraction, drug and alcohol use);

c. infrastructure;

d. technology; and

e. safety management systems/safety culture and the rule-making process.

These discussions were an important mechanism for identifying key issues impacting rail safety, as well as potential options for addressing those issues of interest to a broad range of stakeholders. In addition, the participants themselves were able to exchange information and perspectives with one another, broadening their understanding of the rail transportation system and how each could contribute to improving safety. There was a universal call from participants for collaborative forums on rail safety to be held on a regular basis to promote a better collective understanding of the rail safety regime, and encourage coordinated and/or complementary action among regulators, industry and communities.

We also took the opportunity to do further field work to review rail operations in the regions where the roundtables were held and meet with some of Transport Canada's regional rail safety managers and inspectors.

During this phase, we received over 40 written submissions, with the largest component coming from community groups and the public, followed by industry, provincial and municipal governments, academia and railway unions. These submissions provided key perspectives and insights on rail safety issues and challenges, and included over 235 suggestions on ways to improve the rail safety regime. In addition, comments to our online consultation portal provided an opportunity for a conversation among stakeholders on issues and suggestions for improved rail safety.

4. Reporting phase

This was the final and most challenging phase of the Review. We examined research results, as well as the input received from stakeholders through submissions, bilateral meetings, roundtable sessions, and our online consultation portal, to determine what recommendations we should make to best achieve significant and lasting improvements to rail safety across Canada.

After significant discussion that drew on all of these sources, the findings and recommendations found in this Report began to take shape.

Throughout this phase, we continued to check in with stakeholders to test our assumptions and understanding of the issues, and to ensure that the findings and recommendations we were considering were reasonable, implementable and would have a positive impact on Canada's rail safety regime.

Key Principles for the Report

Building on what has been done

The 2017-18 *Railway Safety Act* Review follows a period of significant changes to the legislation and regulations governing rail safety in Canada. When preparing this Report, we were keenly aware of the significant work that had been completed since the last *Railway Safety Act* Review in 2007 (2007 RSA Review). This includes the implementation of many of the 2007 RSA Review's recommendations, as well as the many changes that were made in the wake of the Lac-Mégantic accident. A comprehensive summary of changes made since 2013 can be found in Annex H. We recognize that the rail system is still evolving as a result of these changes and that their full impact will not be apparent for some time.

In addition, we were mindful of the need to build on the findings and recommendations resulting from more recent studies of rail safety by the Auditor General of Canada and the Standing Committee on Transport, Infrastructure and Communities, as well as Transportation Safety Board of Canada publications.

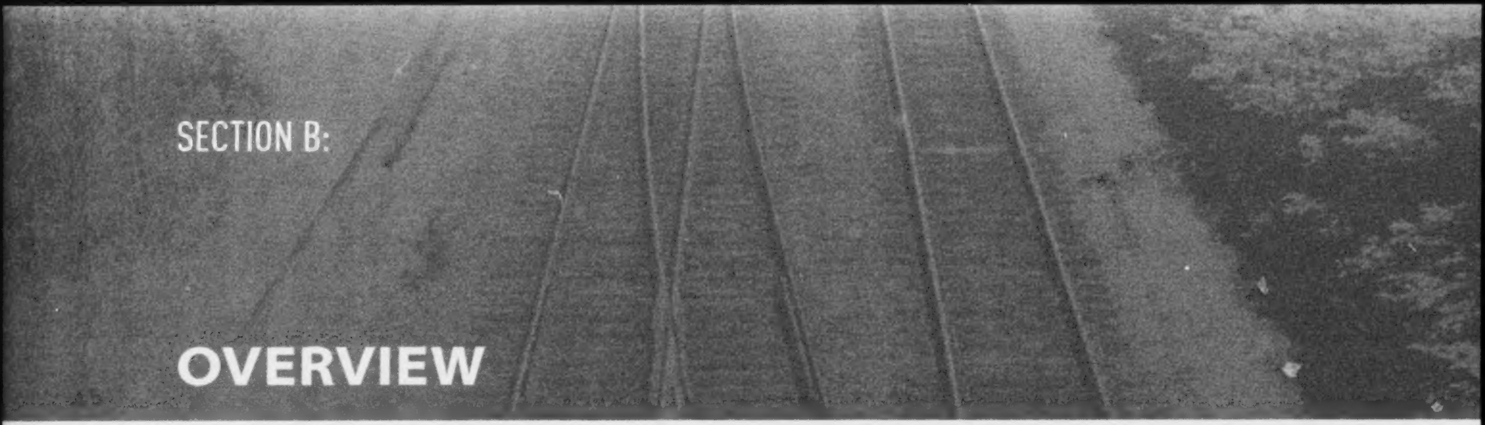
In light of the work that has been done in preceding years, our goal has been to build on previous gains and focus our efforts on long-standing issues where we believe change will have the most significant impact on rail safety.

Our approach

As we set out to develop this Report, we decided that we would focus our efforts on a small number of areas and limit ourselves to recommendations that were absolutely essential to making progress toward resolving difficult, persistent, and complex issues in rail safety.

Since one of the main benefits of an independent review is a fresh perspective on the rail safety regime, we decided that our recommendations would go to the heart of these persistent issues and, where necessary, make recommendations that could guide the evolution of the rail safety regime now and into the future. We also sought to understand the challenges involved in implementing specific solutions so as to better focus our effort on making achievable, practical recommendations that are within the Minister of Transport's authority to implement.

The approach we took to the five key areas for change identified by the Review was to conduct research to understand their roots and their implications for rail safety. We then assessed the various dimensions of the issues, including: barriers to further progress; the views of stakeholders; and the options available for moving forward. This formed a solid foundation for the recommendations that we made. The roundtable sessions and other meetings we held with stakeholders were also very important for refining our understanding of the issues and bringing together a diverse range of stakeholders to discuss options and potential solutions.



SECTION B:

OVERVIEW

Meeting the Challenges for Rail Safety Now and Into the Future

One of the clear goals of this Review has been to assess the current state of the rail safety regime, particularly in light of the many changes that have been made over the past five years. The Review worked to learn where safety issues remain and where the implementation of particular policies or regulations could be adjusted to improve outcomes.

Beyond this, there was keen awareness that to ensure the continued safety and efficiency of rail transportation, the Review must also look to the future. As such, consideration was given to the changes required so that the rail safety regime can be strong and flexible enough to adapt to, and take advantage of, the dramatic changes that will take place in transportation over the next two decades.

The Review identified broad trends with implications for the future of rail transportation, notably via an environmental scan produced by Transport Canada. These include:

- sector restructuring and competitiveness, which will create a need for more agile and resilient supply chains, along with pressures to reduce costs. The global competition for capital and jobs is likely to increase along with the need for global supply chains to be efficient;
- urban intensification, which will make it increasingly difficult to protect transportation corridors amid competing development interests;
- demand for grain and agri-food products, energy and minerals, which is expected to increase, given population growth and industrial activity; and
- the need to embrace innovation without creating new security gaps or widening existing ones, which will be an increasing challenge for all organizations.

The trend analysis work done by Transport Canada suggests that there is a high likelihood that an increasing amount of goods will be transported by rail, especially along Canada's major trade corridors. This in turn will create major pressure to achieve efficient supply chains. There will be further need for the rail safety regime to adapt as technological change creates new risks, particularly in the area of security, but also new opportunities that will require appropriate flexibility and a proactive approach to risk management. Finally, and of particular concern to the Review, the combination of growing urbanization and increased rail traffic in Canada is likely to exacerbate existing rail safety issues linked to the challenges of proximity between rail operations and communities.

The Review also looked at the Government's stated vision and policy directions under *Transportation 2030: A Strategic Plan for the Future of Transportation in Canada*, announced by the Honourable Marc Garneau, Minister of Transport, in November 2016. *Transportation 2030* is an integrated, national strategy for delivering a safe and innovative transportation system to support Canadian travellers, trade and economic growth, a cleaner environment and the well-being of Canadians. While this Review is consistent with *Transportation 2030*'s theme and goal for a "safer, more secure transportation system that Canadians trust," improving Canada's rail safety regime also has strong linkages to the *Transportation 2030* themes and objectives for green and innovative transportation, trade corridors to global markets and timely and more accessible data and analytics.[1]

The Review considered these trends and transportation policy direction when determining its recommendations.

The *Railway Safety Act*

Work throughout this Review included an examination of the *Railway Safety Act* (the Act) to determine the extent to which it meets its objective of ensuring that rail transportation is safe and secure. Most of the legislative recommendations from the 2007 RSA Review have been implemented and have strengthened the rail safety regime. The conclusion is that, by and large, the Act still achieves this goal, with certain elements in particular playing a critical role in ensuring rail safety.

Key components of the Act that are crucial to the rail safety regime include:

a) **The recognition that the railway industry is responsible for managing and mitigating safety risks.** Even though the Minister of Transport has a very important oversight and regulatory role regarding rail safety, success requires the cooperation and collaboration of a number of organizations that have an interest in rail operations and rail safety. This recognition has supported the development of a rail safety regime that requires industry to be an active partner in ensuring that rail transportation is safe and secure.

b) **Safety management systems (SMS).** SMS require the railway industry to identify and address safety risks in a systematic and proactive manner, providing safety benefits that supplement those gained from traditional regulatory approaches. SMS can help lay the groundwork for the development and promotion of a safety culture in the railway industry that is critical to safe operations.

c) **Rule-making provisions.** Under appropriate circumstances, the rule-making process, which supports collaboration between industry and government in determining operating standards, can be an effective and more flexible tool than regulations. The drafting of rules of a technical/operational nature by the industry leverages the industry's capacity to develop and codify measures to reduce risk, while at the same time maintaining the Minister's authority over rail safety requirements.

d) **Graduated enforcement.** Inspectors have a suite of compliance and enforcement options, ranging from letters of non-compliance or letters of concern, to prosecution or suspension of Railway Operating Certificates in very serious cases. The Department can also issue emergency directives and monetary penalties. The Act provides inspectors with the flexibility to select the most appropriate tool for each circumstance to achieve positive safety outcomes, including the option of moving directly to more punitive measures when warranted.

Some amendments are recommended to improve clarity and address specific issues. The major challenge for rail safety in the future is adapting Transport Canada's role in addressing persistent issues, and positioning the Department and the rail sector to meet upcoming safety challenges. The most persistent rail safety challenges of today require the efforts of the railway industry, multiple levels of government, community organizations and the Canadian public to resolve. Federal leadership and facilitation is required to coordinate and leverage the support of all partners to achieve the shared objective of a safer rail transportation system in Canada.

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[1] Transport Canada. Transportation 2030: A Strategic Plan for the Future of Transportation in Canada. Website. (Note: all web links referenced in this Report were accessible as of March 16, 2017.)

Safety: By the Numbers

Canada's rail transportation system

As highlighted by Transport Canada in its 2016 annual report to Parliament on the state of the transportation system, Canada's rail transportation system currently has over 40,000 route-kilometres of track owned primarily by Canada's two Class 1 railways (CN and CP together own approximately 75 per cent of track, with the remaining 25 per cent owned by other railways).[2] As of January 15, 2018, 69 railways held a valid Railway Operating Certificate in Canada,[3] including: three Class 1 railways (CN, CP and VIA Rail); several US railways (AMTRAK and some large US-based freight railways); and a number of federally-regulated short line railways.

The rail system is also a critical part of Canada's trade and transportation corridors, with 19 intermodal terminals operated by either CN or CP to run truck/rail and container intermodal services and 27 Canada-US rail border crossings.[4] According to the Railway Association of Canada, Canada's rail operations help to sustain nearly every part of the Canadian economy, including the manufacturing, agricultural, natural resource, wholesale and retail sectors[5] and tourism. Each year, Canada's freight railways transport over $280 billion worth of goods, representing close to 70 per cent of all intercity surface freight and half of Canada's exports by volume.[6] In 2016, intercity passenger railways transported 4.2 million people, up 1.7 per cent from 2015 and slightly above the five-year average.[7]

From 2007 to 2016, Canadian railways invested over $32 billion to improve safety performance and increase capacity. Of the nearly $4 billion invested by Class 1 railways in 2016, approximately 85 per cent went to improvements to railway tracks, crossings and rolling stock.[8]

Transportation by rail contributes to the efficiency of Canada's transportation network by reducing congestion and wear-and-tear on roads and highways. A 100-car freight train carrying 10,000 tonnes of goods can replace 300 trucks.[9] Railways also have an important role to play in supporting the Government's 2030 greenhouse gas emissions reduction goal. From 1990 to 2015, freight railways have reduced the intensity of their greenhouse gas emissions by over 40 per cent per 1,000 revenue tonne-kilometre, while intercity passenger railways reduced their emissions by approximately 55 per cent per passenger-kilometre.[10]

Are railways getting safer?

In order to determine if railways are getting safer, it is helpful to start with a shared understanding of what "safer" means. An approach to a definition of safety can be borrowed from a research paper submitted to the 2007 RSA Review by Gary M. McLaughlin. He stated:

> [A] railway operation can most probably be classified as to be 'safe' when the risk of occurrences causing damage to humans, property and/or the environments is reasonable, prudent and otherwise acceptable to those who would potentially bear the consequences.[11]

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[2] **Transport Canada.** Transportation in Canada 2016: Comprehensive Report. **2017. p. 20.**

[3] **Transport Canada.** Railway Operating Certificates. **Website.**

[4] **Transport Canada.** Transportation in Canada 2016: Comprehensive Report. **2017. p. 20.**

[5] **Railway Association of Canada.** Rail Trends 2017. **p. 12.**

[6] **Railway Association of Canada.** Railways 101: Canada's Freight Railways Moving the Economy. **Website.**

[7] **Railway Association of Canada.** Rail Trends 2017. **p. 18.**

[8] **Railway Association of Canada Submission. p. 8.**

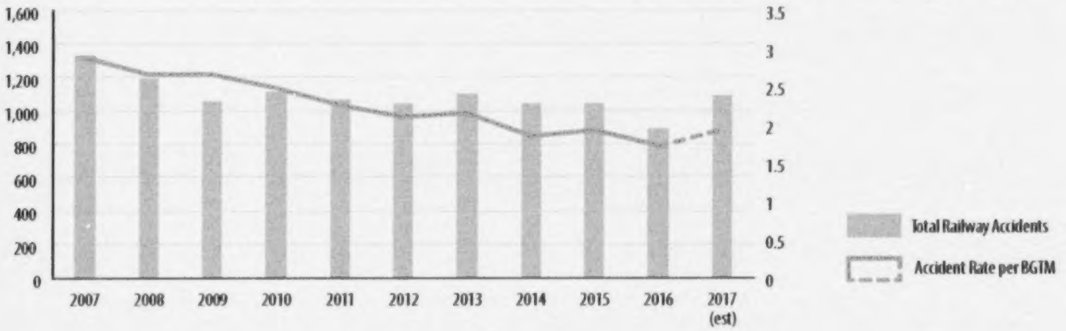
[9] **Railway Association of Canada Submission. p. 7.**

[10] **Railway Association of Canada Submission. pp. 7-8.**

[11] **Gary M. McLaughlin Submission.** 2007 Review of the *Railway Safety Act*: Submission to the Advisory Panel. **April 16, 2007. p. 4.**

Before settling on final recommendations, the latest available statistics on rail safety were reviewed to help determine where improvements have been made since the last Review in 2007, and where problems persist.[12] [13] [14]

FIGURE 1: TOTAL REPORTED RAILWAY ACCIDENTS AND ACCIDENT RATE PER BILLION GROSS TON MILES (BGTM), 2007-2017[15]



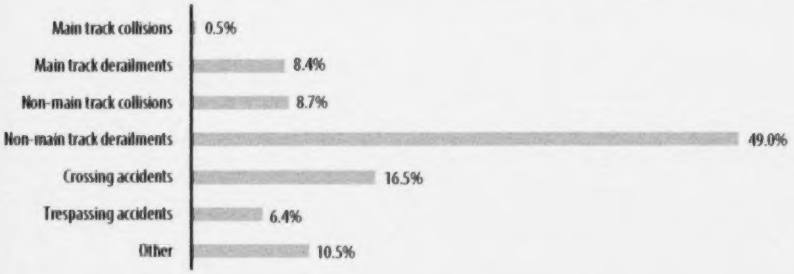
In terms of absolute numbers, since 2007, and as seen in Figure 1, the number of total railway accidents (e.g., crossing accidents, derailments, collisions, etc.) has varied from year to year. There has been no significant upward or downward trend since 2009, although accidents have come down from a peak in 2007.[16]

Accident numbers, however, do not tell the whole story, since they do not take into account the impact of increases in railway traffic or operating changes (such as longer trains) since 2007.[17] The accident rate per billion gross ton miles, which considers the volume of goods transported by railways each year and accounts for both the increase in activity and the use of longer trains, shows that there has in fact been a downward trend in the accident rate since 2007.

Major accident categories

The Transportation Safety Board of Canada (TSB) divides accidents into several categories. The breakdown of accidents in these categories since the 2007 RSA Review is as follows:

FIGURE 2: PER CENT DISTRIBUTION OF RAILWAY ACCIDENTS OCCURRING FROM 2007–2017



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[12] The data used for this section, except where indicated otherwise, is drawn from the Transportation Safety Board of Canada (TSB): Railway data, Statistical Summary – Railway Occurrences 2016 and Monthly rail occurrence statistics. Website.

[13] The interpretation of the statistics in this section draws heavily from the report written by CPCS for the Review. Many of the charts in this section, though using data from the TSB, are based on charts from the CPCS report. See: CPCS. *Assessing the State of Railway Safety in Canada*. CPCS Ref. 16675. November 13, 2017.

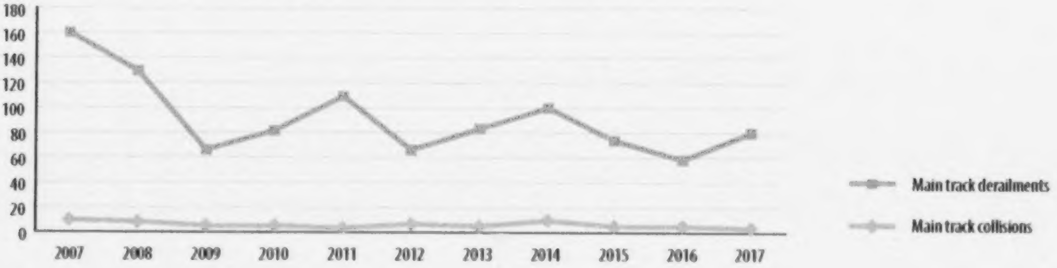
[14] The TSB recently changed how accidents and incidents are categorized. The data in figures 1, 2, 3, and 4 are based on the latest available data from the TSB, which the TSB has retroactively re-categorized back to January 1, 2014.

[15] The data for this chart is drawn from the Transportation Safety Board of Canada: Railway data, and data on billion gross ton miles that the Railway Association of Canada shared with the Review. Note that the numbers for BGTM include both federally- and provincially-regulated railways. However, given that CP and CN, two federally-regulated railways, are responsible for over 90 per cent of BGTM, the Review determined that the usefulness of BGTM merited including it as a measure.

[16] CPCS. *Assessing the State of Railway Safety in Canada*. November 13, 2017. p. 11

[17] CPCS. *Assessing the State of Railway Safety in Canada*. November 13, 2017. p. 21

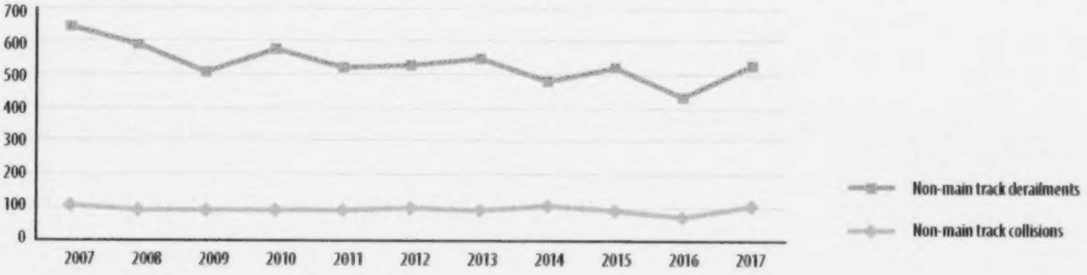
FIGURE 3: MAIN TRACK DERAILMENTS AND COLLISIONS FROM 2007-2017



While main track[18] collisions and derailments make up a small percentage of accidents (approximately 9 per cent between 2007 and 2017), they remain a serious concern given their greater capacity to cause serious human, economic, and environmental harm, owing to the speed of the trains – particularly if dangerous goods are involved.[19] This has been clearly demonstrated by the impact of the train derailments near Gogama, Ontario, in 2015, among others.

As seen in Figure 3, from 2007 to 2017, main track collisions remained infrequent, occurring five times per year on average. Main track derailments over this same period, decreased by approximately 50 per cent from a peak in 2007. From 2007 to 2017, main track derailments averaged 92 per year, in sharp contrast to the period examined by the 2007 RSA Review (1989-2006), during which there were consistently between 100 and 200 main track derailments per year. This marks a significant improvement in rail safety, given that – as noted previously – main track derailments tend to have more serious consequences than other types of rail accidents.

FIGURE 4: NON-MAIN TRACK DERAILMENTS AND COLLISIONS FROM 2007-2017



Non-main track derailments, while typically having minor impacts compared to main track accidents because they usually occur at speeds of less than 10 miles per hour and therefore have a tendency to result in fewer cars being derailed, have remained consistently above 400 per year since 2007, and have not shown any significant downward trend.

Although non-main track accidents do not usually have a major safety impact for people, property or the environment compared to main track accidents, they can be an indicator of the need for improved practices and/or increased training of railway employees, and a stronger organizational safety culture. Indeed, approximately 50 per cent of the uptick in rail accidents in 2017 is due to an increase in non-main track derailments. This has been an ongoing concern, as the 2007 RSA Review Report also noted that there was an issue with the number of non-main track derailments and safety in rail yards.

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[18] The main track of a railway is a track where movement is authorized by a railway company. This often means that it is used for through trains or is designated as the principal artery of the system from which branch lines, yards, sidings, and spurs (i.e. non-mainline tracks) are connected. Main tracks are typically operated at higher speeds than non-main tracks and are thereby generally built and maintained to a higher standard than non-main tracks.

[19] CPCS. *Assessing the State of Railway Safety in Canada*. November 13, 2017. p. 13.

Grade Crossing and Trespassing Accidents

Grade crossing and trespassing accidents have remained persistent and serious problems. Although they make up approximately 22 per cent of total accidents between 2007 and 2017 (compared to 49 per cent for non-main track derailments and 8.4 per cent for main track derailments), they account for 91 per cent of rail-related fatalities and 79 per cent of serious injuries. In real terms, from 2007 and 2017, there were 499 fatalities and 212 people seriously injured due to trespassing on railway property, and 259 deaths and 282 people seriously injured at grade crossings accidents. The Review sees these statistics as a serious concern. Although the numbers speak for themselves, they do not fully convey the human cost of lost loved ones, devastating life-altering injuries, and psychological impacts on survivors, first responders and railway employees.

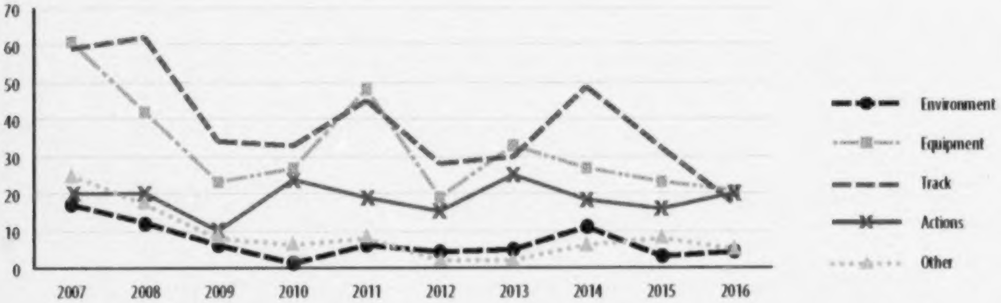
As Canada's cities continue to grow and expand alongside railways, these types of accidents threaten to become more frequent. That is why a key portion of this Report (see Section C, Chapter 4) is dedicated to examining grade crossing and trespassing issues and the steps that the federal government can take to help make communities and railways safer.

What is causing accidents?

The Transportation Safety Board of Canada (TSB) collects data on the causal factors that contribute to accidents. These are grouped into environmental (e.g., weather), equipment-related (e.g., axles, brakes, trucks, wheels), track-related (e.g., geometry, rails), action-related (e.g., due to human behaviour, such as: failure to use equipment properly; inadequate or inappropriate maintenance; operating at improper speeds, inattention due to fatigue), and "other" causes not part of the above categories.[20]

Because there can be multiple causes for a single accident, and because the TSB cannot investigate every accident that occurs, it must rely on the information that is reported to it, which may not always identify causal factors. Nevertheless, the data provides important insight into factors that contribute to rail accidents.[21]

FIGURE 5: **ASSIGNED FACTORS IN MAIN TRACK DERAILMENTS, 2007-2016**[22]



As can be seen in Figure 5, equipment and track failures are the primary cause of main track derailments, but they are trending downward. As technology advances and railways make additional investments in infrastructure improvements, track and equipment-related accidents are anticipated to continue declining. Accidents due to environmental factors as well as other causes are also on a downward trend. By contrast, the number of accidents caused by human actions has remained fairly constant.

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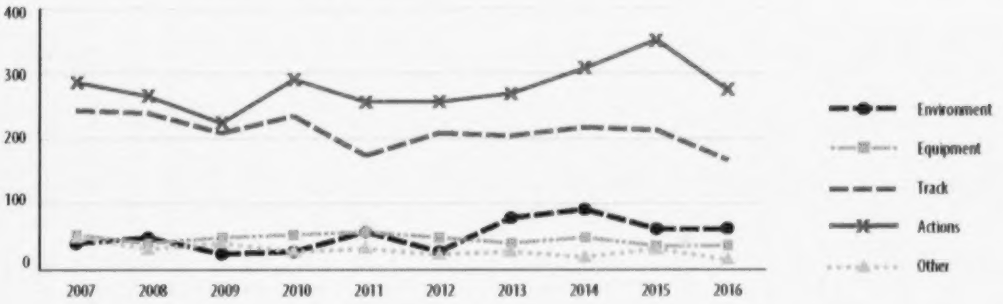
20 CPCS. *Assessing the State of Railway Safety in Canada.* November 13, 2017. pp. 30-31.

21 CPCS. *Assessing the State of Railway Safety in Canada.* November 13, 2017. p. 29.

22 CPCS. *Assessing the State of Railway Safety in Canada.* November 13, 2017. p. 30, Figure 5-1.

FIGURE 6: ASSIGNED FACTORS IN NON-MAIN TRACK DERAILMENTS, 2007-2016[23]



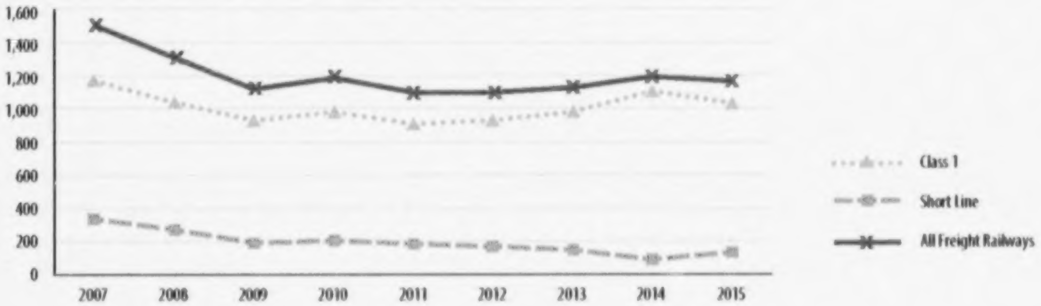
For non-main track derailments, and as seen in Figure 6, accidents caused by actions (i.e., human actions) have consistently remained the most significant cause of non-main track derailments with no sign of improvement. Environment, equipment, and other causes play a role in a relatively small proportion of accidents, while track-related accidents are declining.

As CP notes on its website, between 2005 and 2015, advances in the use of technology led to a 65 per cent decline in railway incidents caused by equipment failure and a 35 per cent decline in track-related incidents, yet accidents resulting from human actions increased by 11 per cent.[24]

The Review is concerned that human actions, which can be difficult to address, have continued to be behind a significant number of railway occurrences (incidents and accidents), particularly for non-main track (i.e., rail yards), grade crossing and trespassing accidents. That is why, as will be seen later on, this Report focuses on ways to support and improve human and organizational performance (see Section C, Chapter 1.3 Safety Culture and Chapter 2 Human and Organizational Performance).

Freight Train Safety

FIGURE 7: TOTAL FREIGHT RAILWAY ACCIDENTS, 2007-2015[25]



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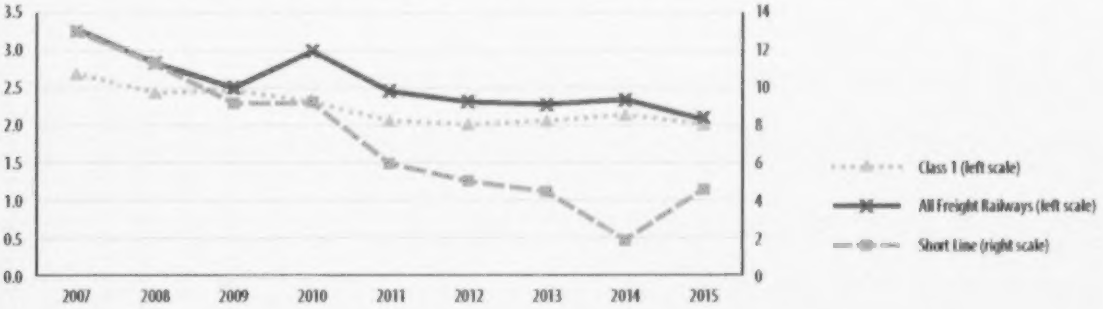
23 CPCS. *Assessing the State of Railway Safety in Canada*. November 13, 2017. p. 34, Figure 5-5.

24 CP. Locomotive Voice and Video Recorders. Website.

25 CPCS. *Assessing the State of Railway Safety in Canada*. November 13, 2017. p. 38, Figure 6-1.

FIGURE 8: NUMBER OF RAILWAY ACCIDENTS PER BILLION GROSS TON MILES, 2007-2015[26]



It is worthwhile to make a final comparison between Class 1 freight railways and short line railways, as there are important differences in their safety records that have implications for rail safety as a whole. Figure 7 shows that short lines are responsible for fewer railway accidents in total than Class 1 freight railways. That is not surprising, given that Class 1 freight railways transport a much larger volume of goods than short lines. As illustrated in Figure 8, when the accident rate is normalized by billion gross ton miles to account for this difference, we can see that the accident rate is in fact, higher for short line railways.

The Review is concerned by this fact. As discussed later (see Section C, Chapter 5.1.4), short line railways often do not have the necessary capital to adequately invest in infrastructure improvements. Given that track failures are a significant cause of railway accidents in Canada, it may be necessary to provide assistance to short line railways to ensure that accidents in this category continue to decline.

Public Trust and Perception of the Rail Safety Regime

While certain persistent issues are cause for concern, and there are improvements to be made, statistics show that overall, Canada's rail transportation system is safe. However, many Canadians remain unconvinced.

During the summer of 2017, the Panel met with the interim and former mayor of Lac-Mégantic. Their words had a powerful impact on our understanding of the lasting issues faced by survivors of the tragic accident. They told us that a number of the town's inhabitants suffer from post-traumatic stress and feel intense fear when they see or hear trains passing through their town (which is similarly noted in a recent health study of the community).[27] Some citizens are concerned that there are not enough inspections in the area, and do not believe that the infrastructure going through their town is sound, despite assurances and significant actions by the Central Maine and Quebec Railway and Transport Canada. These statements echo those that were made to representatives of the Standing Committee on Transport, Infrastructure and Communities when they visited the town in 2016.[28] A key takeaway from these meetings is that the relationship of trust between this community and both the railway company and Transport Canada is strained. The Review has also heard similar messages from community groups during its consultations and in the written submissions it has received, including Rail Safety First, Safe Rail Communities, Coalition des citoyens et Organismes engagés pour la sécurité ferroviaire de Lac-Mégantic and Nous et les trains.

Section 3(b) of the Act states that one of the objectives of the Act is to "encourage the collaboration and participation of interested parties in improving railway safety and security." Based on feedback we received from communities, we believe that there is more work to be done to ensure that Canadians and communities feel safe and included, and trust in the safety of the rail transportation system.

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[26] CPCS. *Assessing the State of Railway Safety in Canada*. November 13, 2017. p. 38, Figure 6-2.

[27] Direction de santé publique de l'Estrie. Bulletin d'information de la Direction de santé publique de L'Estrie. No. 34. January 2017. p. 3.

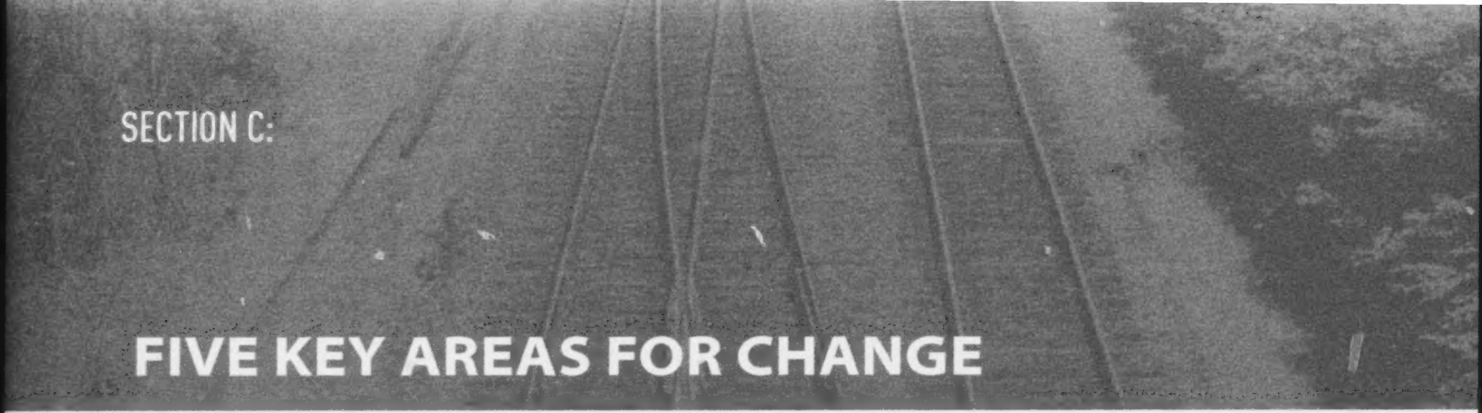
[28] Standing Committee on Transport, Infrastructure and Communities. *Report 6 - An Update on Rail Safety*. June 2016. p. 2.

Since the July 2013 rail accident in Lac-Mégantic, there has been increased public scrutiny and media attention on rail transportation issues, and growing calls for a more open, transparent, and collaborative approach to safety issues affecting rail operations, particularly when they involve the transportation of dangerous goods. There are greater demands for information from citizens and municipalities, with a shift from requesting more general information to asking for technical briefings to help improve understanding of key elements of the rail safety regime, like track safety rules (to learn, for example, why speed limits vary according to class of track) and grade crossing safety.

The new reality for Transport Canada and the railway industry is that they must show, rather than tell, Canadians that the rail transportation system is safe, and that efforts are being made to make it safer still. The Lac-Mégantic accident has had repercussions not just for its inhabitants, but for Canada as a whole, and it will take a long time and sustained effort on the part of Transport Canada and the railway industry to rebuild the trust and reputation that have been tested.

Moving Forward

Through our research, commissioned studies, consultations with stakeholders and submissions received, our conclusion is that there has been good progress in making rail transportation in Canada safer over the past decade. However, problems persist in key areas, which will not be resolved without action, and in some cases (such as crossing and trespassing accidents) will likely get worse without intervention.



SECTION C:

FIVE KEY AREAS FOR CHANGE

Many changes that have been made by Transport Canada and railways to improve inspection, enforcement, compliance and risk management have had a positive impact on rail safety performance. Notwithstanding these improvements, progress on some of the issues identified in the 2007 *Railway Safety Act* Review as well as other reports has been limited.

This Review focused to a large extent on these persistent issues and what changes could be made to address them, and also to improve the capacity of Transport Canada to meet the challenges of the future.

This Section outlines five areas where a strategic change needs to be made in the role of Transport Canada to enhance rail safety performance. This includes: developing a sustainable rail safety regime based on the three critical elements of safety; enhancing the role of Transport Canada in human and organizational performance; developing a stronger leadership role in technology to facilitate safety; significantly expanding the role and activities of the Department in collaboration with other levels of government and railway companies to prevent grade crossing and trespassing accidents; increasing collaboration among the key players (governments, railways and communities) to address rail safety issues; and finally, improving the information available to communities to strengthen public trust and improve dialogue.

1) Three Elements of an Effective and Sustainable Rail Safety Regime

Issue: While Transport Canada has a robust compliance and enforcement presence, the implementation of safety management systems (SMS) and of a positive safety culture has been a significant challenge for both the regulator and industry

Challenge: Transport Canada's Rail Safety Program needs to broaden its focus to fully integrate SMS and safety culture elements in its rail safety regime

In order to provide the best possible assessment of the quality of Canada's rail safety regime, the Review went to considerable lengths to understand trends and best practices for safety management and the regulator's role in a high performance safety regime.

To build this understanding, it was important to be familiar with leading thinkers on safety, innovations within sectors with advanced safety culture regimes (such as nuclear, chemical and NASA) and the experience of other countries. This was achieved through literature review and our attendance at two major international conferences where presentations were provided by industry and regulatory experts.[29]

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[29] 2nd International Safety Culture Summit in Halifax, Nova Scotia, October 10-12, 2017; and the 27th International Railway Safety Council 2017 in Hong Kong, October 22-27, 2017

In Canada, the Review researched the initiatives of organizations such as the National Energy Board,[30] the Canadian Nuclear Safety Commission,[31] and the Chemistry Industry Association of Canada and its chemistry industry members, which have been global leaders in Responsible Care[32] for 30 years.

The evolution of thinking about safety has been strongly influenced by the modern understanding of the causes of accidents in most safety-critical industries.[33] It is generally recognized that leading safety organizations rely on three interdependent (and mutually reinforcing) elements as part of their safety programs: compliance with technical regulations and standards; safety management systems (SMS); and safety culture[34] (including elements of human and organizational performance programs).

The traditional approach to safety assumed that reliability could be designed into an operation through training of staff on technical standards and on enforcing compliance with those standards. This approach focused on accidents and aimed to provide procedures, largely based on past experience, to prevent similar incidents in the future. The role of the regulator in this approach to safety was one of developing regulations or standards, and enforcing them. Similarly, companies developed their own standards and practices, and focused on implementation and staff compliance.

As experts developed a better understanding of safety, they concluded that organizational decisions and cultures played a significant role in major accidents and that standards and rules alone were not enough to manage risks. Accidents would still happen, even though procedures, standards or rules were being followed.

The introduction of SMS was viewed as a way to bring a systemic approach to managing safety-critical activities and drawing linkages between processes, through the identification of risks or patterns where problems emerge and implementing safety programs to achieve improved performance.

Subsequently, some safety-critical sectors found that they had to complement SMS with a safety culture approach, in order to achieve a total organizational environment and commitment to safety.

This approach recognizes that safety improvement not only deals with standards, programs and compliance, but also requires the capacity for continuous organizational learning and anticipation of safety risks. This approach was also determined to be essential to address human and organizational performance issues that were identified as contributing factors in an increasing proportion of incidents, including industries (such as railways) that had achieved major progress in reducing the rate of accidents.

As this evolution from safety engineering to SMS to safety culture progressed, sectors such as nuclear and chemical, experienced successive accident rate decreases (see Figure 9).[35] The expectation, and certainly the experience, of leading safety critical sectors is that this evolution towards an increasingly positive safety culture leads to reduced incidents, as staff become more engaged, committed and empowered to communicate, learn and identify safety issues and take action to deal with them.[36]

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[30] **National Energy Board.** Safety Culture. **Website. The National Energy Board will become the Canadian Energy Regulator. While legislation to transform the National Energy Board into the Canadian Energy Regulator was before Parliament at the time of writing, it did not appear that the changes proposed would materially affect those elements of their mandate that are referenced herein.**

[31] **Canadian Nuclear Safety Commission.** Document History for REGDOC-2.1.2, Safety Culture. **September 2016.**

[32] **Chemistry Industry Association of Canada.** Responsible Care: Our Commitment to Sustainability. **Website.**

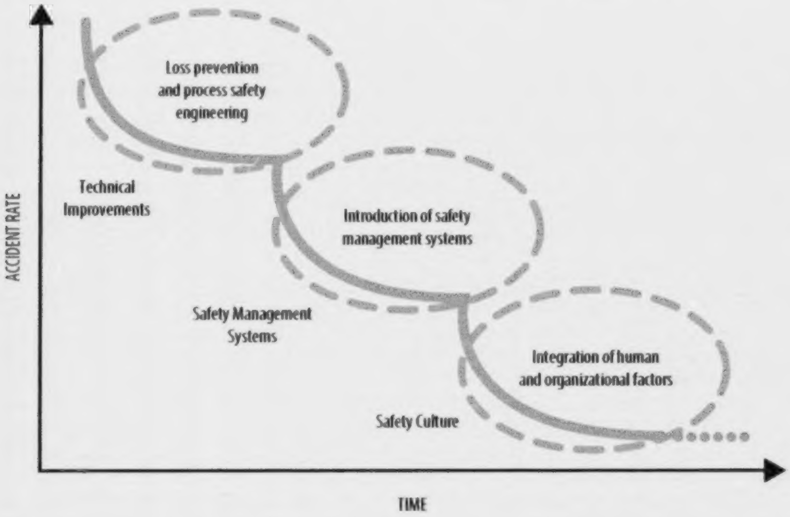
[33] **Kelly, Terry.** ***An Examination of the Regulated Requirements for Canadian Railway Safety Management Systems.*** **SMS REPORT No.0703. SMS Aviation Safety Inc. August 2007.**

[34] **The working definition of safety culture for the purposes of this Review can be found further in this Chapter.**

[35] **Adapted from Daniellou, François, Simard, Marcel, Boissières, Ivan. Fondation pour une culture de sécurité industrielle.** Human and Organizational Factors of Safety: State of the Art. **January 2011. p. 3.**

[36] **Doppelbauer, Josef.** Safety in Railways – Quo Vadis? **p. 4; European Union Agency for Railways.** Railway Safety Performance in the European Union. **p. 7; Australia. Office of the National Rail Safety Regulator.** Preparation of a Railway Safety Management System Guideline. **January 20, 2013. p. 10.**

FIGURE 9: EVOLUTION OF SAFETY BEST PRACTICES TO MAXIMIZE PERFORMANCE


ACCIDENT RATE
Loss prevention and process safety engineering
Technical Improvements
Introduction of safety management systems
Safety Management Systems
Integration of human and organizational factors
Safety Culture
TIME

Transport Canada, working with railway companies, should recognize and embrace this state of the art approach to the evolution of safety performance. By adopting these leading safety practices, Transport Canada, with industry support, can take the next step to position Canada's rail safety regime to effectively respond to the unprecedented challenges and opportunities it will face over the coming decades. To do so, adjustments will be required to how safety management systems are overseen, safety culture capacities must be reinforced and human and organizational performance must be improved.

1.1 Compliance with Technical Regulations and Standards

By far the most robust of the three elements within the Department's rail safety regime, Transport Canada's compliance monitoring program currently consists of three main categories of activities: 1) promotion of compliance; 2) monitoring of compliance; and 3) enforcement of compliance and/or mitigation of threats to safety. Oversight activities performed by Transport Canada under this program include:

- regulatory inspections to verify compliance with the *Railway Safety Act* (the Act) and its regulations, rules and standards, as well as other relevant legislation;
- education and awareness to provide program, regulatory and compliance information for railway employees and other stakeholders;
- follow-up actions related to railway incidents;
- responses to railway-related complaints and inquiries; and
- enforcement measures against serious violations of the Act, its regulations, rules and standards.

It is through these activities that Transport Canada inspectors ensure that railways are operating in a compliant and safe manner. This aspect of a rail safety regime involves the direct review of the fundamental aspects of rail operations, and sets minimum standards and guidelines for key rail operations, such as tracks, signals, equipment, bridges and operations that must be met by all railways. The Act also provides compliance and enforcement tools for inspectors to ensure that identified issues are addressed. Information compiled from these activities also feeds into and informs the Department's risk-based planning exercises.

To carry out its compliance monitoring program, Transport Canada uses a risk assessment and management approach which aims to maximize the allocation of resources to the highest risk areas, by bringing together relevant information on inspections, incidents and SMS to guide activities for a given year. Using information from Transport Canada's inspection database (Rail Safety Integrated Gateway, or RSIG), the Department analyzes inspection results to plan future oversight activities.

In addition, Transport Canada plans randomized inspections, to help identify trends and emerging issues, and opportunity inspections for things like enquiries or complaints or inspections that allow for efficient use of resources. The results of these three inspection activities (i.e., promotion of compliance; monitoring of compliance; and enforcement of compliance and/or mitigation of threats to safety) are then used in the Department's annual work-planning process to direct the next year's activities.

This risk-based system offers many advantages in focusing Transport Canada's efforts and resources on the most critical areas affecting safety and in reviewing trends over time. The Review believes that there is an ongoing need to maintain these compliance monitoring functions within Transport Canada's Rail Safety Program, and to continue to collect and analyze available information to properly assess the state of compliance, while identifying emerging trends and risks impacting rail safety. Upon reviewing the Department's rail safety risk assessment and planning methodology, and based on discussions with departmental officials, it appears to the Review that a strengthened capacity for data analytics, which brings together relevant safety and activity data from all applicable sources (e.g., RSIG, the Transportation Safety Board and Statistics Canada) to produce business intelligence and predictive analytics, would help strengthen this element of the Department's rail safety program. Such an effort would also align with the stated goals of *Transportation 2030* related to modernization and better data and evidence to inform decision-making.

That said, the Review believes that, on the whole, Transport Canada has a robust compliance program, and past improvements in this area appear to have led to reductions in incidents relating to infrastructure and operations. The Review recognizes that this core role provides assurances that railways are safe and meeting their obligations under the Act, and also provides invaluable information to assess risks and evaluate industry trends.

While the above activities are necessary for the effective delivery of Transport Canada's Rail Safety Program, they are not sufficient and must be supplemented by advances in the approach to safety that aim to address the underlying, systemic risks of rail transportation.

1.2 Safety Management Systems

The safety management systems (SMS) concept was first introduced in the chemical and nuclear industries, following several major accidents, to bring improvements to the industries' safety performance. The approach has since been adopted by other sectors (including transportation) as an effective way to improve company safety practices. In recent years, North American oil and gas regulators have been working together to further improve safety and environmental outcomes by leveraging safety culture in conjunction with effectively implemented SMS.[37]

The Transportation Safety Board of Canada (TSB) notes in its 2016 Watchlist that it "has repeatedly emphasized the advances of safety management systems (SMS), an internationally recognized framework to allow companies to effectively manage risk and make operations safer."[38] In fact, the TSB has indicated the need for formal safety management processes and their effective oversight on its annual Watchlist of safety improvement areas since 2010. The TSB notes that "[s]ome companies consider safety to be adequate as long as they are in compliance with regulatory requirements, but regulations alone cannot foresee all risks unique to a particular operation."[39]

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[37] **Transport Canada.** Audit of the Oversight Practices of Safety and Security Management System. **February 2017. p. 16; National Energy Board.** Advancing Safety in the Oil and Gas Industry - Statement on Safety Culture. **June 2, 2014.**

[38] **Transportation Safety Board of Canada.** Watchlist 2016. **Website.**

Implementation of Safety Management Systems in the Canadian Railway Industry

The Act recognizes that railway companies are responsible for rail safety, and that safety management systems should be used to continually manage safety-related risks. The Act defines SMS as a "formal framework for integrating safety into day-to-day railway operations and includes safety goals and performance targets, risk assessments, responsibilities and authorities, rules and procedures, and monitoring and evaluation processes."

SMS has been an existing safety requirement for federally-regulated railways since 2001, and the regulations were noted in the 2007 RSA Review as being "the first of their kind in the federal Canadian transportation sector."[40] SMS enables railways and Transport Canada to go beyond addressing the problems associated with an individual event (e.g., a broken rail or signal problem) to addressing the overall processes in the organization for the management of safety-critical activities. Ideally, SMS should enable companies to identify and manage new and emerging risks before an event occurs, moving from a retrospective to a predictive approach. An important part of achieving this change is understanding and identifying leading indicators (potential safety issues vs. actual events) and assessing how improved systems can deal with those risks. In the Canadian railway industry, SMS requirements have been overlaid on to all the other requirements contained in the Act and supporting regulations, rules and engineering standards.

The Review has heard that safety management systems in the Canadian railway industry have had a difficult history. Their implementation seems to have been marred by a number of false starts, by inconsistent commitment and direction in relation to the approach taken and by challenges related to a lack of training, communication and capacity in both the railway industry and Transport Canada. All of these issues regarding SMS were raised in the 2007 RSA Review.

Despite notable work carried out by the Department in response to recommendations on SMS from the 2007 RSA Review, including updating and improving the existing SMS guidance materials,[41] the 2013 Report of the Auditor General of Canada concluded that "the Department has made limited progress in shifting from the traditional oversight approach, largely based on inspecting federal railways' compliance with rules and engineering standards, to a system-based approach that integrates oversight of safety management systems into activities."[42]

In spite of past difficulties, Transport Canada began to turn the corner in 2015, with the publication of updated SMS regulations that further address oversight issues. Updates included additional detail and clarity to facilitate more effective implementation, enforceability and expansion of the scope of application to local railway companies that operate on federally-regulated tracks. Changes also included new requirements to enhance rail SMS, including: railway company appointment of an accountable executive; continuous monitoring and regular assessment of safety; non-punitive internal reporting by employees; as well as increased involvement of employees and their unions.

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[39] Transportation Safety Board of Canada. Watchlist 2016. Website.

[40] 2007 *Railway Safety Act* Review. *Stronger Ties: A Shared Commitment to Railway Safety, Review of the Railway Safety Act*. November 2007. p. 66.

[41] Transport Canada. *Guide for Developing, Implementing and Enhancing Railway Safety Management Systems*. 2010. Accessed through archive.org at: https://web.archive.org/web/20130628005644/http:/www.tc.gc.ca/eng/railsafety/guide-sms.htm

[42] Auditor General of Canada. *2013 Fall Report of the Auditor General of Canada*. Fall 2013. Paragraph 7.82.

Transport Canada has undertaken a number of activities to implement these regulations and to integrate them into its Rail Safety Program. These activities include:

- communicating the new requirements to industry;
- holding a workshop with industry on SMS (which was attended by the Review Panel Chair);
- developing new industry guidance documents in April 2016;
- redefining the role of SMS auditors and staffing new director and auditor positions;
- promoting consistency through annual assessments of audit teams' performances and adding an audit specialist to the Audit Review Committee to support consistency in the drafting of audit reports;
- developing company risk profiles to determine the frequency of audits;
- carrying out a total of 26 audits in 2016-17 (15 full, 9 partial, 2 targeted), with an additional 10 completed to the end of 2017 (5 full and 5 partial);
- developing an SMS auditor manual (finalized in 2017);
- promoting consistency and the exchange of information across the rail inspectorate through national "bootcamps" (one of which was attended by the Review Panel Chair); and
- revamping staff training on the new SMS regulations and the associated auditing course, with the goal of having all auditors complete the refresher training by January 2019.

The objective of these initiatives is to ensure that rail safety auditors across the country have a common and consistent understanding of audit principles, including guidance on planning and conducting audits, sample interview questions and interpretations of expectations on the content of a SMS.

Transport Canada's activities represent a tremendous amount of work in a relatively short period.

In order to engage the Rail Safety Program and railways in implementing SMS as quickly as possible, the audits were started before fully developing the audit program, training and guidelines. Inevitably, this led to a number of implementation issues that have been identified by the Department, railways and the Railway Association of Canada (RAC) for resolution. By addressing these issues, Transport Canada can ensure that the SMS is more relevant and effective in improving safety.

What we have heard

The Review heard that, during the first round of audits, inconsistent interpretations of the requirements of the new regulations led to some companies being found in non-compliance with the regulations, even though the company practices were thought to be equivalent to, if not exceeding, the regulatory requirements. The Review was also informed by stakeholders that audits were overly process-based and at times focused on details that had no bearing on safety risks or on the safety of the operations. It was also suggested that a lack of adequate training and understanding of the industry led to some questionable findings and non-compliance determinations.

Lastly, it appears that the initial audit methodology does not leave any room for SMS auditors to note observations or minor, immaterial deviations from the prescribed requirements, the only categories of findings available to them being "deficiency" and "non-compliance." This was recognized by both the inspectorate and by industry as being an incentive to comply with the "letter of the law," sometimes at the expense of developing and maintaining a comprehensive and effective SMS focused on safety performance.

It became clear to the Review that, collectively, the challenges associated with audits are creating the conditions for railway companies to treat their SMS activities as an administrative exercise to meet the regulations, rather than an integrated program to manage and improve safety. In implementing SMS, the question that Transport Canada needs to address is whether they want railway companies to have safety programs that look like the SMS regulations, or whether railway companies should build their safety programs around their specific operations and in doing so meet the requirements of the SMS regulations.

Considerations

The Review believes that a railway company SMS should contain all of the required elements—organized in a way that works in the context of a company's railway operations. This allows railway companies to establish a program that not only works for them, but that may go beyond the basic requirements of the *SMS Regulations,* rather than an administrative exercise that is only used during Transport Canada audits.

> **"We could help industry integrate SMS into their safety programs by doing it better ourselves."**
>
> *Regional Manager, Surface Branch, Transport Canada*

In order to move forward, the Review concludes that it will be necessary to integrate a portion of compliance inspections with SMS audits. It will not be enough to simply point out non-compliances and look for corrective actions, or continue to audit on the current three-to-five year cycle strictly to identify that a SMS process is in place and being followed by a railway company. Rather, regulatory compliance inspections and SMS audits should be linked together as targeted audits.

Transport Canada identifies targeted audits as the process whereby subject-matter expert inspectors and trained auditors work together to conduct an in-depth examination of a safety issue that links to one or more of a railway company's SMS processes and helps evaluate their effectiveness and the root causes of safety issues. Ideally, using information (and expertise) from inspections and audits to identify areas of focus will result in targeted SMS audits becoming a regular part of the compliance monitoring regime. The goal of this approach is not only to identify non-compliances, but also to help the company identify strengths, determine leading indicators and evaluate their systems to minimize future risks. This will require a shift for Transport Canada from a focus on pure compliance and enforcement, to playing a more facilitative role in providing railway companies with observations, based on risk, with a view to improving their safety management systems, while also ensuring that the core elements of the SMS processes are in place.

Transport Canada has faced many challenges with effectively incorporating SMS into its Rail Safety Program since the regulations first came into force in 2001. While there is still work to do to ensure that this is a strong and integrated part of an overall safety management regime, the Review nonetheless acknowledges the work done by Transport Canada since 2015, and encourages the Department to continue these efforts.

To improve the likelihood that SMS will become a vital and relevant part of the overall safety management regime, both the regulator and the railway industry need to maintain the existing momentum, and further integrate these processes into their respective organizations' safety culture.

Recommendation 1 - To strengthen SMS to ensure a greater focus on effectiveness and safety outcomes, it is recommended that:

A. **Transport Canada continue initiatives to train and build internal capacity to audit and assess the effectiveness of a railway company's SMS, in addition to ensuring that the SMS meets the requirements of the regulations.**

B. **SMS audit reports identify weaknesses and strengths of railway company safety management systems and provide direction for improvements, as well as best practices for continuous learning. Results of audits should help companies identify areas for improvement that allow them to address the root causes of safety issues, rather than simply fixing technical non-compliances with the SMS Regulations.**

C. Transport Canada transition from "system-in-place" audits to an integrated approach that focuses on key risk areas (e.g., signals, yards, bridges) and combines the expertise of specialized inspectors with trained railway systems auditors. This will improve the integration of a systems-based approach with the expertise of inspectors, which can help link processes and systems to safety results.

1.3 Safety Culture: The Next Step for Safety

Safety culture strengthens safety management systems by including the commitment, leadership, two-way communications, learning, and trust that drives the values and behaviour of the entire organization. A company with a strong safety culture is constantly learning and sharing with employees and others in a high trust environment to understand, assess and manage risk and to identify safety improvements.

The European Railway Agency Safety Unit has concluded that safety culture reinforces safety management systems. In its guidance document, entitled "Application guide for the design and implementation of a Railway Safety Management System: Developing and Improving Safety Culture in the Organization," it notes:

> *Therefore organisations need both an SMS and an effective Safety Culture in order to achieve safety performance, we reiterate again that safety culture can be seen as the 'atmosphere' that pervades the SMS and makes it effective and robust.*[43]

What is Safety Culture?

While there are many definitions of safety culture, the Review has retained the one adopted by the Transport Canada-led SMS Working Group for this Report:

> The safety culture of an organization is the result of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization's health and safety management system.
>
> Organizations with a positive safety culture are characterized by communications from various stakeholders founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures.[44]

"If an organization has a poor safety culture, it is a management or leadership issue not an employee attitude issue. The interventions, therefore need to target managers and supervisors rather than frontline employees. There is evidence that these interventions are effective at changing employee perceptions and injury rates."

Dr. Mark Fleming, Saint Mary's University
Learning Document

The key to a positive safety culture is the total commitment by organization leaders and staff to safety as a value, which includes constant communication and learning to identify hazards and determine the safest practices. Safety culture cannot be separated from organizational culture. For this reason, a positive safety culture cannot emerge in a highly punitive organization which assumes safety incidents are largely the fault of employees. Safety performance requires companies to understand the safety situation and engages staff in determining how to improve and mitigate the risks.[45]

In April 2016, the Transportation Safety Board of Canada held a Transportation Safety Summit that brought together senior executives from government and the transportation industry, along with some of their bargaining agents. The proceedings of this meeting noted the importance of establishing a safety culture that actively encourages people to provide data through safety management structures and to make maximum use of the information emerging from them to improve safety performance.[46]

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[43] European Railway Agency Safety Unit. Application guide for the design and implementation of a Railway Safety Management System: Developing and Improving Safety Culture in the Organization. December 19, 2013. p. 15.

[44] Transport Canada. Achieving an Effective Safety Culture. Website.

[45] Conklin, Todd. *Redefining safety for a rapidly changing business.* 2nd International Safety Culture Summit, October 10-12, 2017, Halifax, Nova Scotia.

Why is Safety Culture Important?

Investigations into several disasters have noted the absence of safety culture as an important contributing factor. Examples include the Chernobyl[47] and Fukushima[48] nuclear disasters; the NASA Columbia space shuttle explosion;[49] the Gulf of Mexico Deepwater Horizon oil spill;[50] and closer to home, the tragic accident in Lac-Mégantic. On the latter, the Transportation Safety Board of Canada concluded that Montreal, Maine & Atlantic Railway's (MMA's) weak safety culture contributed to the continuation of unsafe conditions and practices and compromised MMA's ability to effectively manage safety.[51]

> **"A strong safety culture is generally considered as a vital condition to a well-functioning SMS. It is sometimes said that it is well possible to have a good Safety Culture without a formal SMS, but it is not possible to have an effective SMS without a good Safety Culture."**
>
> *European Union Agency for Railways, Safety Unit*
> *"Developing and Improving Safety Culture in the Organization", p. 15*

Essentially, culture drives human behaviour, and as demonstrated elsewhere in this Report, human behaviour has been a causal factor of a significant portion of rail accidents. Much of the research conducted by the Review suggests that by impacting people's and organizations' thinking about the tasks that are performed in high risk environments such as rail transportation, behaviours and shared visions about what constitutes acceptable safety practice will emerge.[52] These would then translate into the decisions that are taken by employees at all levels of the organization, from the strategic to front-line operations.

From there, it follows that unsafe behaviours, processes or near misses can be reported, addressed and communicated, and solutions can be incorporated into railway companies' SMS practices. Ultimately, a reduction of accidents can be achieved by developing and nurturing a positive safety culture.

What has been done

The 2007 *Railway Safety Act* Review and Safety Culture

Recommendations from the 2007 RSA Review generated important safety culture initiatives that continue to this day; but this effort needs to be accelerated and reinforced. As part of its response, Transport Canada established the *Railway Safety Act* Review Steering Committee, which included several joint working groups focused on elements of the recommendations of the 2007 RSA Review. These groups included broad representation from Transport Canada, railways, unions and others. One in particular, the Working Group on SMS, was also tasked to look at safety culture.

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[46] Transportation Safety Board of Canada. TSB Transportation Safety Summit 2016 Proceedings. Transportation Safety Summit, April 21-22, 2016, Ottawa, Ontario.

[47] World Nuclear Association. Chernobyl Accident 1986. Updated November 2016.

[48] United States. National Research Council. Committee on Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Plants. Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Plants. October 29, 2014. Chapter 7.

[49] Columbia Accident Investigation Board. Report of Columbia Accident Investigation Board, Volume I. August 26, 2003. Chapter 7.

[50] United States Chemical Safety Board. The U.S. Chemical Safety Board's Investigation into the Macondo Disaster Finds Offshore Risk Management and Regulatory Oversight still Inadequate in Gulf of Mexico. April 13, 2016.

[51] Transportation Safety Board of Canada. Railway Investigation Report R13D0054. August 20, 2014. Finding 15.

[52] Accou, Bart. Beyond the organisation: identifying further contributors to Railway Safety Culture. Presentation. 27th International Railway Safety Council 2017, October 22-27, 2017, Hong Kong. p. 7.

The Working Group on SMS produced some excellent work, including a definition of safety culture, a description of the main elements of a positive safety culture,[53] and the development of a Rail Safety Culture Checklist brochure.[54] The quality of this work is illustrated by the fact that these materials are still used as reference documents by the Railway Association of Canada (RAC) as noted in its submission to the Review,[55] and by the European Railways Agency, Safety Unit in its guidance on safety culture and SMS.[56] The Rail Safety Culture Checklist is no longer accessible on Transport Canada's website, for reasons unknown.

One of the key outcomes of this work was that the RAC, supported in part by Transport Canada, decided to work with railways to perform safety culture assessments. Transport Canada and the RAC jointly funded the development and initial testing of an assessment methodology for Canadian railways. The work on these safety culture assessments has benefited enormously from the expertise and leadership of Dr. Mark Fleming, who is the CN Professor of Safety Culture at Saint Mary's University. His work has provided excellent guidance on safety culture as well as the specific safety culture expertise to undertake these assessments.

Additionally, CN has completed two safety culture assessments since 2010, which, in its view, have had a significant impact on their company, and CP completed a survey in 2014. The RAC has completed three safety culture assessments to date (i.e., Central Maine and Quebec Railway, CANDO and GO Transit). Two additional assessments are underway (i.e., VIA Rail and Southern Railway of British Columbia) and scheduled to be completed in the second half of 2018. The Review was briefed on the results of one of these assessments by a short line (CANDO), and there is no doubt that its assessment had a very important impact on understanding how to strengthen its safety regime.

What is the Current Status of Safety Culture in Canada's Rail Safety Regime?

A significant step forward has been made to embrace safety culture by the RAC. However, the Review has some concerns that any number of factors could undermine the modest, but important, progress to date. A number of significant actions are required to ensure sustained progress in this area. Safety culture assessments for railways have, up to now, been funded largely by the RAC; have been generally conducted on a voluntary basis; and the depth of commitment of the entire RAC membership is not clear.

Without additional financial support, it would likely be cost prohibitive to mount an assessment program that covers the full range of short lines or other railways, and that could be delivered over the span of a few years. Finally, the recognition by Transport Canada of the importance of safety culture in the railway industry and how it relates to SMS is not evident. This raises an important question: what is the role of the regulator in this third critical element of an effective rail safety regime?

The Role of Transport Canada

The Review's research indicates that safety culture must grow from within an organization and be an integral part of the overall organizational culture. At the Review's thematic roundtable session on SMS and Rules (held on November 8, 2017, in Toronto, Ontario), there was a general consensus among participants that safety culture cannot be prescribed by government. The Review agrees with this assessment. At the same time, research indicates that it is important that regulators play a positive and supporting role in encouraging a focus on safety culture within the railway industry.[57]

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[53] Transport Canada. Achieving an Effective Safety Culture. Website.

[54] Transport Canada. Safety Culture Checklist. TC-1004142. November 2010. Website.

[55] Railway Association of Canada Submission. p. 21.

[56] European Railway Agency, Safety Unit. Application guide for the design and implementation of a Railway Safety Management System: Developing and Improving Safety Culture in the Organization. 2013. pp. 12, 19.

[57] Bradley, Claudine. Regulator safety (oversight) culture: How a regulator's culture influences safety outcomes in high hazard industries (Doctoral dissertation). 2017.

There are a variety of ways that Transport Canada can support the development of a positive safety culture across all modes of transportation.

First, the railways, which are responsible for the safety of their operations, should lead efforts to strengthen safety culture and tailor their approach to their respective operations. However, it is important that regulators and railways work together to support safety culture initiatives (including periodic railway company assessments) and share learning gained from collaborative work in this area.

Second, it is important that Transport Canada signals its support for the development of positive safety culture to industry. This can be done in various ways. One approach employed by the nuclear industry, the National Energy Board and by the European Union Agency for Railways is to adopt a clear policy statement (developed through extensive consultation with industry) indicating strong support for the advancement of safety culture as a critical part of an effective safety regime. The National Energy Board established their safety culture policy statement in 2014,[58] following extensive internal consultations, and an external posting to solicit feedback from stakeholders and the public. Adopting a similar policy statement for the federally-regulated rail transportation sector would also support the work that the Department and industry have undertaken on SMS.

Third, it is essential for regulators to build an expertise and capacity in this area, and also to engage in significant training for staff. The Nuclear Energy Agency of the OECD has indicated that regulators need to be conscious of how their own safety culture impacts the culture of the regulated industry, and not hamper the willingness and efforts of those organizations to take on their primary responsibility for safety.[59] Transport Canada should be looking to other high hazard industry regulators (e.g., the National Energy Board, Canadian Nuclear Safety Commission), for guidance in defining and acquiring the capacity in human and organizational factors, and behavioural and social sciences expertise required to advance safety culture. It should also, much like railway companies should do with their own employees, favour increased dialogue and reporting, as well as increased discussion based on sound risk analysis, to resolve identified issues.

Another potential action to promote the advancement of safety culture is through the provision of direct support for either safety culture assessments, academic research (e.g., such as the occupational health and safety research work underway at Saint Mary's University in Nova Scotia), or a dedicated safety culture institute. For example, a $2 million grant from the Federal Railroad Administration (FRA) allowed the American Short Line and Regional Railroad Association (Association) in the US to set up the Short Line Safety Institute to assess safety culture for short lines, develop best practices, and improve safety culture and knowledge across the industry. The FRA is a member of the Association's Board of Directors and the Association uses these assessments as a basis for shared learning among short lines, within the constraints of commercially protected information. This institutional capacity provides a focus for short line railways and the FRA to undertake safety culture assessments, share information and learnings, and identify areas for continuous rail safety improvement. An institute of this nature in Canada could carry out several important roles, such as:

- fostering collaboration among rail sector stakeholders (government, railway companies, unions and others);
- capturing and sharing lessons learned from other safety critical industries;
- developing tools to assess safety culture and improvement strategies;
- assisting Transport Canada in developing the regulator's safety culture; and
- building capacity in the railway industry through training and development of experts, and providing advanced education in safety culture to railways.

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[58] National Energy Board. Government of Canada. Advancing Safety in the Oil and Gas Industry - Statement on Safety Culture. June 21, 2017.

[59] Nuclear Energy Agency. Organisation for Economic Co-operation and Development. The Safety Culture of an Effective Nuclear Regulatory Body. March 10, 2016. p. 7.

The Review believes that to make significant progress on this third element of a robust safety regime (i.e., safety culture), a set of actions is required, namely:

- signalling a clear policy direction on, and support for, safety culture by Transport Canada;
- strengthening Transport Canada's expertise, capacity and leadership in this area;
- active involvement of the Department with the Railway Association of Canada (RAC) and railways in the learning process related to safety culture assessments and other supporting initiatives;
- financial support to ensure short lines, in particular, are able to conduct safety culture assessments; and
- encouraging non-governmental institutional capacity to provide expertise, advice, conferences or other work, that supports railways in addition to Transport Canada.

Considerations

Significant progress regarding safety culture will not occur without strong buy-in and support by railway companies, especially the Class 1 railways. The rail sector in Canada is far behind other leading safety critical sectors in this area. Railway companies themselves should develop clear policy directions and plans to implement safety culture, recognizing that safety culture is a journey and is unlikely to be prescriptively regulated by government. Sectors that have been successful have recognized that a safety culture approach is good for their organizations, good for business, and a major step toward the continuous improvement of safety outcomes.

Transport Canada's role regarding safety culture is not visible at this time and needs to be developed and articulated. Canadian railways, along with the RAC, have taken some important first steps to embrace safety culture but they have only started on this path. Significant initiatives are required by both Transport Canada and railways (with the active participation of unions) to develop this third critical element of an effective safety regime. Since the achievement of a positive safety culture is a journey that often takes years of organizational commitment and change for both railways (and their employees), and Transport Canada, it is not expected that this change will occur quickly, but the journey needs to begin now.

All of these initiatives can be undertaken without changes to legislation and are part of the overall mandate of Transport Canada to advance safety in the railway industry.

Recommendation 2 – Recognizing that safety culture is a key component of a safe rail system and that safety culture improvements must be driven by railway companies with active promotion and support by Transport Canada, it is recommended that:

A. railway companies develop and formally adopt safety culture policy directions and plans, including an approach to safety culture assessments, improvements and information sharing.

B. Transport Canada develop a safety culture policy statement that provides clear support for the fundamentals of safety culture as part of the rail safety regime, and supporting guidance on the relationship between safety culture, SMS and technical compliance and the regulator's role with respect to each of these elements.

C. Transport Canada develop internal capacity on safety culture, human factors, and behavioural and social sciences within its Rail Safety Program, and actively support the ongoing exchange of best practices and continuous learning within the railway industry.

D. Transport Canada, in partnership with industry and others, provide core funding to support initiatives such as safety culture assessments by short line railway companies, and academic institutions that promote continuous learning, to further strengthen safety culture in the railway industry.

2) Human and Organizational Performance – Ensuring the Right Resources for the Safety Challenge

Issue: There are a wide range of human and organizational performance issues that can have a major impact on safety such as fatigue, distractions, and training, among others, which are factoring in a higher proportion of rail accidents

Challenge: Building up Transport Canada's expertise to address safety issues linked to human and organizational performance, and continuing the Department's efforts on fatigue management, which are a step in right direction

The cornerstone of a safe, efficient, effective and successful industry is its workforce. As safety practices evolve in order to keep pace with changing workplaces, so does the understanding and management of the human element of safety. *Human and organizational performance* is a shift towards an operating philosophy focused on the human element of safety in order to protect people, property and the environment from human error. It is a systems approach, based on behavioural science and the works of James Reason and Sidney Dekker, among others, that starts by recognizing that humans are not infallible and mistakes will happen.

Todd Conklin (one of the human and organizational performance experts who spoke at the 2017 2nd International Summit on Safety Culture in Halifax, Nova Scotia) has concluded that a strong tendency in organizations to separate safety from operational learning and quickly focus on punishing people actually undermines the learning process. He notes that staff who have performed well for many years do not become "stupid" overnight. There are often systemic issues that lie behind an accident that are related to organizational or operational processes. If this is not understood, organizations quickly assume the accident is a result of a lapse by staff or lack of compliance, and miss the opportunity to learn from the event.[60] He states in his book that, "We must create a world where action is the result of learning. Getting better at operational learning is the only way through which we can move safety and reliability to the next logical place."[61] In his view the best approach to operational learning is to engage management and staff in understanding all the human factors and organizational processes that affect safety, and then find the most effective safety approach to manage risks.

Under a human and organizational performance model, performance improvement is pursued, not through 'blame and punishment', but by identifying and reducing hidden weaknesses and traps associated with the operational systems that employees must navigate to do their jobs, and by recognizing that both the organization and the people within it have a shared role and responsibility towards safety. James Reason offers that the best approach to improving safety would be to improve the safety culture of an organization. The foundation for change (improvement) then becomes a drive for safety at the systems level, rather than at the more reactive, localized level.[62]

Section C, Chapter 1 of this Report focuses on the importance of Transport Canada, and railway companies in partnership with unions, taking action to promote and strengthen safety culture within the rail sector. A regulator's behaviour towards a regulated entity directly impacts how the entity responds. The Review is confident that safety culture guidance available from other high-hazard industries, combined with the capacity acquired through the implementation of the recommendations in Section C, Chapter 1, will equip Transport Canada to take a holistic approach to supporting the evolution of managing safety through human and organizational factors.

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[60] Conklin, Todd. *Pre-Accident Investigations: Better Questions - An Applied Approach to Organizational Learning*. March 27, 2016. p. 35.

[61] Conklin, Todd. *Pre-Accident Investigations: Better Questions - An Applied Approach to Organizational Learning*. March 27, 2016. p. 29.

[62] Maury Hill and Associates, Inc., Adaptive Safety Concepts. A Study of the Role of Human Factors in Railway Occurrences and Possible Mitigation Strategies. August 2007. pp. 38-40.

> “The soft stuff is the hard stuff.”
>
> *CN Executive*

With a strong safety culture in place within an organization, attention needs to be given to equipping managers and employees with the education, processes and tools to ensure that all understand their respective roles and impact on promoting, ensuring, and continually striving for improvements of, a safe work environment.

From a systems approach, human and organizational performance recognizes that organizational systems have the potential to influence the safe and at-risk behaviour of individuals, and that the influencers of behaviour (antecedents and consequences) include organizational processes as well as people, and the physical environment (e.g., equipment, layout of workspace). Also helpful in this approach is the inclusion of the people who actually do the work in the identification of safety solutions. Furthermore, there is a recognition that setting up rule after rule, procedure after procedure, and then punishing those who do not follow them only goes so far in improving safety.

Once the variables that influence behaviour are understood, organizational adjustments can be made to make it easier for individuals to make safe choices. Therefore, sustaining safety improvement in the future requires changing the system-level behaviour (i.e., safety culture) of executives, managers, supervisors and frontline employees alike. This includes behaviours related to following rules and procedures, hazard identification and remediation, and behaviours that shift from systems that incent underreporting to systems that truly encourage reporting.

2.1 Fitness for Duty

For the purposes of the Report, fitness for duty is defined as “[a] condition in which workers are physically, physiologically, and psychologically capable of competently and safely performing their tasks.”[63] Referring to the nuclear industry as an example, the general tenets of human and organizational performance that apply to fitness for duty are grounded in a positive safety culture and (in no particular order) generally revolve around the additional elements of:

a. training;

b. drug and alcohol impairment;

c. fatigue (work and non-work-related factors);

d. hours of service; and

e. physical and mental health (e.g., medical health assessments for key positions).

Literature reviews and roundtable sessions in Dartmouth, Nova Scotia, were clear that fitness for duty is a complex topic that cannot be addressed without collaboration from all parties (i.e., regulators, human factor specialists, industry and unions/other employee representation). It requires a layered approach that takes an individual from home to work and back home again, and that approach may include some form of regulatory coverage, education and awareness, and, most importantly, flexibility. It was also noted that some of these elements are easier to address than others. For example, rules related to medical and training requirements for safety-critical employees already exist, although amendments would be needed in order to expand applicability to other key railway maintenance and support positions.

Conversely, fatigue is a persistent issue that has yet to be addressed to the satisfaction of all stakeholders, despite numerous attempts. In addition to the complexity of understanding the science around fatigue itself, previous attempts by Class 1 railways have resulted in limited success in addressing the issue. Such attempts have included, for example, elaborate scheduling algorithms that try to reconcile the physiological conditions leading to fatigue with the operational needs to move trains and the reality that employees want to manage their own schedules and time.

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[63] **Canadian Nuclear Safety Commission.** Human Performance Management – Fitness for Duty (REGDOC-2.2.4) Draft. **November 2011.**

While issues around training and random drug testing are explored here, this Chapter will largely focus on the element of fatigue. Properly addressing fatigue across the rail sector has the greatest potential to positively affect human and organizational performance, given that it also impacts several elements that make up fitness for duty.

2.2 Training Within the Industry

While training covers a broad area (e.g., physical, psychological, technical) and is one of the key elements that influences human and organizational performance, few comments or submissions were received by the Review on the matter. The few training-related issues that were raised generally focused on the technical training in place to educate and qualify railway personnel and community first responders.

Although outside the scope of the Review's mandate, it is further worth noting that most of the comments received focused on the need for training for first responders on the transportation of dangerous goods, which is an area that is currently being addressed by Transport Canada within the Transportation of Dangerous Goods Program.

Testing and training on new technologies for railway personnel were generally seen to be important by roundtable session participants. In particular, participants in Vancouver and Calgary[64] brought forward concerns that onboarding of more technology will require a more prescriptive regulatory framework around training, given the variability of training delivery between railway companies. Additionally, it was noted that smaller operators are further challenged by having limited resources to access training, even though railway companies such as CN and CP have indicated an openness to making their excellent training facilities (i.e., CN's in Winnipeg; CP's in Calgary) available to short line operators.

Submissions made to this Review by the Coalition des citoyens et Organismes engagés pour la sécurité ferroviaire de Lac-Mégantic[65] and the Institut en Culture de Sécurité Industrielle Mégantic[66] suggested that variability in training between companies should be addressed through standardized training of railway personnel in key positions. It was further offered that one proven approach to address this need would be through a network of accredited organizations similar to that of trade schools or other learning institutions. As such, training would be readily accessible to smaller railway operators with offerings tailored in the language of choice (i.e., French or English, depending on demand).

In this regard, the Review was asked that consideration be given to providing support for short lines to access training facilities on new technologies and approaches to safety.

Formally, a railway company's obligation regarding training (i.e., knowledge management) is addressed in the *Railway Safety Management System Regulations, 2015*.[67] These provisions are supported through numerous rules, regulations and orders created under the Act that make further reference to "trained and qualified employees."

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[64] See summaries of the roundtable discussions at: https://www.tc.gc.ca/en/reviews/railway-safety-act-review-2017-18.html. Website.

[65] Coalition des citoyens et Organismes engagés pour la sécurité ferroviaire de Lac-Mégantic (CCOESF) Submission. pp. 6–7.

[66] Institut en Culture de Sécurité Industrielle Mégantic (ICSIM) Submission. p. 4.

[67] Transport Canada. Railway Safety Management System Regulations, 2015. Sections 25, 26, and 27.

The 2007 RSA Review looked at training for operating crews and ultimately refrained from making a recommendation on the matter, as it recognized that although the applicable regulations had not been updated since 1987, industry programs are updated on an ongoing basis and monitored by Transport Canada, which is still the case today.[68]

Unions have pointed out to the Review[69] [70] that there is still a need for the regulations to be amended and modernized, with consideration given to including non-critical railway personnel, as well as minimum technical training standards for managers. In this latter case, this would help address the demographics of an aging managerial workforce that is retiring and being replaced by a much younger workforce with less hands-on technical expertise.

Although Transport Canada certifies aviation and marine crew members, there are no provisions for certifying railway employees or approving railway training programs. As such, each company is awarded considerable latitude in preparing and providing training and certification tailored to the specific needs of its employees. The Review heard from some Transport Canada inspectors that they occasionally note gaps in the consistency of training (e.g., knowledge) of railway personnel, and while CN and CP have taken steps to address training gaps through company training centres in Winnipeg and Calgary, further efforts could be made to strengthen training requirements of railway personnel.

As part of the deliberations for its June 2016 Report, *An Update on Rail Safety*, the Standing Committee on Transport, Infrastructure and Communities (the Standing Committee)[71] met with stakeholders from Lac-Mégantic. In order to address some of their concerns, the Standing Committee made a series of recommendations, of which one (i.e., Recommendation 3) was directed at training of railway employees and recommended that, *"...Transport Canada put in place an enhanced qualification and training program for the railway industry for engineers and other workers directly involved in rail safety."*

Transport Canada responded to the Standing Committee in October 2016 that it was actively reviewing existing training and qualification requirements for railway employees with an initial focus on short line railways.[72]

While consideration was given to recommending approaches to the certification of railway employees in safety-sensitive, safety-critical and non-critical positions, Transport Canada's response to the Standing Committee supplements the Review's understanding that the Department is currently in the process of addressing the issue. The Review is satisfied and encouraged by Transport Canada's current efforts to update and broaden its approach to the railway employee qualification and training framework, with a view to revising/replacing the existing regulations. This is an important undertaking, given the number of railway industry changes in the areas of new technology, increased staff turnover, and associated new hires. Additionally, the Review is of the opinion that Recommendations 2, 3 and 13 in this Report will also contribute to making progress on the issue.

2.3 Impairment and Random Drug Testing

It is a strongly accepted practice in high-hazard industries, such as the railway industry, that employees must be fit for duty in order to work. As previously indicated, this can include rest, physical and mental health, training, as well as being free from the influence of any drugs or alcohol that could reduce employees' capacity to work safely.

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[68] 2007 *Railway Safety Act* Review. *Stronger Ties: A Shared Commitment to Railway Safety, Review of the Railway Safety Act*. November 2007. pp. 163–164.

[69] UNIFOR Submission. p. 15.

[70] Meeting between the 2017-18 *Railway Safety Act* Review Panel, UNIFOR and Teamsters Canada Rail Conference. June 7, 2017.

[71] Standing Committee on Transport, Infrastructure and Communities. *Report 6 - An Update on Rail Safety*. June 2016. p. 4.

[72] Hon. Marc Garneau, Minister of Transport. Letter from the Minister of Transport to the Chair, Standing Committee on Transport, Infrastructure and Communities. October 5, 2016.

One of the concerns raised by railways during the roundtable sessions in Dartmouth, Nova Scotia, and through submissions received is that Canada does not allow for random drug testing of railway employees, as is the case in the US or Europe. The focus on this issue has been amplified over the course of this Review due to the federal government's proposed legislation to legalize cannabis, and the uncertainty over its implementation and reach.

Moreover, while provincial/territorial governments are making it clear that they will manage and control the sale and use of cannabis in a manner that appears to be at least as stringent as alcohol, there is concern in the railway industry that legalization will result in the normalization and social acceptance of the substance, and that this will in turn result in increased use by railway employees that work in safety-sensitive and safety-critical positions.[73] In addition, while the testing methods to detect cannabis are improving, traces of the drug are known to remain in the body long after individuals are no longer impaired, and testing protocols to detect impairment are also evolving.

The argument for random drug testing is that there is a small portion of railway staff (e.g., including in safety-critical positions) that may not be fully able to carry out their assignments because they are working under the influence of cannabis or other drugs. Railways point to the US experience, where the Federal Railroad Administration's (FRA) mandatory random drug testing programs[74] have been consistently recording violations as evidence that substance abuse exists in the railway industry, and that deterrents such as mandatory random drug testing are also required in Canada. In its meetings with the Review, the FRA noted that the annual reported violation rates remain low and have not exceeded 1 per cent for several years now,[75] but it believes that the random drug testing program does act as a deterrent.

As a result of human rights legislation in Canada, mandatory random drug testing has not been prevalent. The generally accepted approach to any drug testing of employees is that it must be for cause (i.e., post-incident, for suspicion of intoxication or at random under terms of a return to work contract following an identified and treated addiction). Employers must have a valid reason for asking for testing.

The landscape appears to be evolving, however, with the Canadian Nuclear Safety Commission (CNSC) having recently formalized requirements for its licensees to randomly test their employees in safety-critical positions as part of its updated Fitness for Duty Policy.[76] Similarly, as part of its broader 2011 Fitness for Duty Policy, the Toronto Transit Commission (TTC) implemented a mandatory random drug and alcohol testing program in spring 2017 for its designated employees (those that work in safety-sensitive, management or designated executive positions). While this program is the subject of an ongoing arbitration regarding its validity, the Ontario Superior Court recently denied an application for an injunction to restrain its implementation, and the TTC continues to randomly test designated employees for alcohol and drugs, as of the writing of this Report. On the other hand, as recently as December 2017, the Alberta Court of Queen's Bench issued an injunction to stop Suncor Energy's mandatory random drug testing program.[77] While the facts and characteristics of each case are undoubtedly different, the conditions under which mandatory random drug testing could be carried out appear to be shifting, and it is not clear to the Review how this debate will conclude.

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[73] CN Submission. p. 30.

[74] **United States. Code of Federal Regulations.** Control of Alcohol and Drugs, Title 49, Part 219.

[75] **United States. Code of Federal Regulations. Federal Railroad Administration.** Administrator's determination of random alcohol and drug testing rates. December 23, 2016. Section 219.625. Using Subsection (1), the FRA has set the testing rate at 25 per cent for 2017 based on the determination that the data for two consecutive calendar years showed that the reported random testing positive rate was less than 1.0 per cent.

[76] **Canadian Nuclear Safety Commission.** Human Performance Management – Fitness for Duty, Volume II: Managing Alcohol and Drug Use, version 2 (REGDOC-2.2.4). January 2018.

[77] **McKay-Panos, Linda.** Yet Another Development in the Saga of Random Drug and Alcohol Testing at Suncor. **University of Calgary Faculty of Law Blog: January 3, 2018. ABlawg.ca.**

What is clear to the Review, however, is that existing policies and agreements under the rail safety regime already prohibit drug use when operating equipment, and that this will not change with the legalization of cannabis. General Rule G of the *Canadian Rail Operating Rules*[78] specifically outlines the prohibition of possession or use of intoxicants or mood altering agents by employees on duty or subject to duty. In particular, General Rule G (iii) states:

> The use of drugs, medication or mood altering agents, including those prescribed by a doctor, which, in any way, will adversely affect their ability to work safely, by employees subject to duty, or on duty, is prohibited.

The issue of random drug testing goes beyond the rail sector and requires careful consideration by the federal government as a whole, as well as by all high-hazard industries. It appears to the Review, based on what is known at this time, that any consideration of mandatory random drug testing must be done in the context of a broader fitness for duty approach to managing human performance. Those that are blazing new ground in this field, such as the Canadian Nuclear Safety Commission, have been hard at work on these matters for close to a decade, and have carefully considered random drug testing as one of many measures to promote a safe workplace. Transport Canada and the railway industry should build on this work and consider its applicability in the rail sector.

The pending legalization of cannabis should serve as a catalyst for frank dialogue between railways, their employees and their unions about impairment while at work and fitness for duty. This discussion should be included in railways' and unions' collaborative work to improve their safety management systems and to promote safety culture. While the Review is not prepared to recommend that Transport Canada require railways to develop mandatory random drug testing of its employees,[79] it nonetheless encourages both industry and Transport Canada to consider a number of measures that would help advance safety in the face of the pending legalization of cannabis. Measures such as ongoing communication, education packages and programs on the effects of cannabis and other drugs, as well as research to help determine acceptable impairment thresholds and testing methods, would set the rail sector on a path to deal with this issue while the legal landscape evolves, and while it wrestles with the equally important issues of safety culture and fatigue.

2.4 Fatigue

In 2016, the Transportation Safety Board of Canada (TSB) added fatigue in freight train operations to its annual Watchlist.[80] The TSB indicated that since 1994, sleep-related fatigue has been identified as a contributing factor, or as a risk, in 23 TSB railway investigations, with 19 of them involving operating crew members on freight trains. The 2016 Watchlist additionally notes that worker fatigue and its effect on fitness for duty is an ongoing issue that continues to require attention.

Fatigue is pervasive in the transportation sector where 24/7 operations, 365 days a year, are the norm and workers are subject to shift work,[81] disruptive schedules and long on-duty hours. It is widely recognized that fatigue affects a worker's wellness and fitness for duty because of its potential to degrade several aspects of human performance. As research in other sectors has shown, fatigue takes on many forms and is not restricted to a specific craft or sector of the workforce. Addressing this issue presents an excellent opportunity to positively influence behaviours in a way that could significantly benefit safety as it relates to human performance.

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[78] Transport Canada. Canadian Rail Operating Rules. December 14, 2016.

[79] It is not clear to the Review that companies need government intervention to develop these programs, as the Toronto Transit Commission (TTC) example illustrates.

[80] Transportation Safety Board of Canada. Watchlist 2016. Website.

[81] International Agency for Research on Cancer. IARC Monographs Programme finds cancer hazards associated with shiftwork, painting and firefighting. Press release No. 180. December 2007.

Transport Canada's rail safety regime does not reflect current fatigue science, nor does it provide adequate protection for the operating employee against fatigue. The regime is based on the individual's ability to judge their own level of fatigue, rather than a combined employer-employee responsibility for proactively managing fatigue.

Attempts have been made over the last 20 years by both Transport Canada and the railway industry to address the issue of fatigue through fatigue studies, fatigue management guidelines, fatigue management plans and scheduling algorithms, to name a few. Additionally, a number of rules and regulations[82] have been enacted to date to address fatigue and other human and organizational performance factors, namely:

- Section 28 of the *Railway Safety Management System Regulations, 2015;*
- *Work/Rest Rules for Railway Operating Employees, 2011;*
- Fatigue Management Plans (a requirement of Section 6 of the *Work/Rest Rules for Railway Operating Employees, 2011*);[83]
- Rule A(x) of the *Canadian Rail Operating Rules (CROR), 2016;*
- *Railway Rules Governing Safety Critical Positions, 2000;* and
- *Railway Medical Rules for Positions Critical to Safe Railway Operations, 2006*

Although the framework to deal with human and organizational performance issues, including fatigue and fitness for duty, already exists through the *Railway Safety Management System Regulations, 2015*, the Review has heard that, in practice, the elements that make up fitness for duty are typically treated as stand-alone items, rather than as integrated elements of a more comprehensive approach. The result is an absence of an overarching view that brings these elements together within Canada's rail safety regime, and that would add consistency across the railway industry.

When it comes to human and organizational performance, what appears to differentiate the Canadian and North American rail sector from other high-hazard industries such as aviation and energy is that those other organizations have been evolving beyond a rules-based system to focus on safety culture development as part of that holistic view towards improving safety.[84] [85] As it relates to fatigue, both the aviation and energy sectors have added a fatigue risk management system (FRMS) under their safety management systems to supplement prescriptive measures found in rules or regulations.

What has been done

The Review looked at a number of models employed abroad and in other modes which can be considered in the context of Canada's rail sector.

United Kingdom

In addition to the legal requirements related to hours of service and risk identification in the workplace, the United Kingdom's (UK's) Rail Safety and Standards Board (RSSB) and the Office of Rail and Road have published extensive guidance documents to help industry stakeholders understand and comply with their obligations under the UK regulations related to fatigue management.[86]

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[82] Transport Canada. Rules. Website; Transport Canada. Regulations. Website.

[83] Transport Canada. Fatigue Management Plans – Requirements and Assessment Guidelines. Revised March 1, 2011.

[84] Maury Hill and Associates. *Human Factors*. pp. 38-40.

[85] Fleming, Dr. Mark, and Ronny Lardner. "Safety culture – the way forward". *The Chemical Engineer*. March 1999.

[86] United Kingdom. Rail Safety and Standards Board. Managing Fatigue – A Good Practice Guide (RS/504 Issue 1). September 2012.

The RSSB's comprehensive guidance sets out the factors to consider as part of a railway company's FRMS to address human and organizational factors both within and outside of the work environment. Non-work-related elements for consideration in the UK concept include, for example, physical and mental health, lifestyle (e.g., diet, alcohol, drugs and multiple jobs) and stress (e.g., due to family circumstances).[87] The general guidance applies to all employees, although additional requirements are defined for employees working in safety-critical positions. It is worth noting that a robust FRMS needs to include not only countermeasures for reducing risk once one is fatigued, but also measures for reducing the risk of becoming fatigued.

Transport Canada – Civil Aviation

The approach used by Transport Canada's Civil Aviation Program includes a voluntary FRMS as part of aviation safety management systems, supported by guidance material that covers a wide range of on-duty and off-duty factors that can affect a person's ability to manage fatigue and arrive to work fit for duty.[88] In addition, Part VI of the *Canadian Aviation Regulations* provides the basic framework and prescriptions for fitness for duty of flight crews including hours of service, although this framework does not apply to maintenance personnel or other aviation employees.

In July 2017, Transport Canada published proposed regulations to: strengthen existing mechanisms related to flight crew fatigue; act on advances in scientific principles and fatigue knowledge of the past few decades; and be consistent with standards set in other international jurisdictions.[89] The proposed regulations would amend prescriptive requirements and introduce an FRMS exemption mechanism, as follows:

1. **Prescriptive requirements** would identify maximum work periods and minimum non-work periods for flight crew members, and introduce a new concept of cumulative duty hour limits and defined rest periods after duty that factor in disruptive schedules, consecutive night duty periods, time zone differences and crew positioning to address issues of cumulative fatigue.
2. **The performance-based Fatigue Risk Management System** would allow air carriers to deviate from the prescribed limits, provided they can demonstrate by way of a safety case that they can provide at least the same level of safety as the prescriptive requirements. This approach recognizes that prescribed limits may not suit all operators and opens the door to alternative strategies for managing the actual fatigue risk in specific operations.

Canadian Nuclear Safety Commission (CNSC)

The CNSC's REGDOC 2.2.4 *Fitness for Duty*[90] for licensees describes one of the most comprehensive approaches regarding human and organizational performance for a Canadian regulatory body. It recognizes the complexity of fatigue;[91] the realization that a one-size-fits-all approach is not feasible; the need to address the matter by different means for different classes of employees; external factors such as drugs and alcohol,[92] medical and mental health; the need for fatigue awareness training; and the need for prescriptive hours of service. It also opens the door to random drug testing in Canada. In this latter regard, CNSC has established a list of impairment limits for safety-critical positions for a variety of drugs.[93] With a graded approach, the CNSC considers the application of requirements to be commensurate with the risks and particular characteristics of a given facility or activity.

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[87] United Kingdom. Office of Rail Regulations. Managing Rail Staff Fatigue. January 2012.

[88] Transport Canada. Fatigue Management Strategies for Employees (TP 14573). April 2007.

[89] Transport Canada. Regulations Amending the Canadian Aviation Regulations (Parts I, VI, and VII – Flight Crew Member Hours of Work and Rest Periods. Regulatory Impact Analysis Statement. Canada Gazette. Part I: Vol. 151, No. 26. July 1, 2017.

[90] Canadian Nuclear Safety Commission. REGDOC-2.2.4: Human Performance Management – Fitness for Duty. November 2015.

[91] Canadian Nuclear Safety Commission. REGDOC-2.2.4: Human Performance Management – Fitness for Duty, Managing Worker Fatigue. March 2017.

[92] Canadian Nuclear Safety Commission. REGDOC-2.2.4: Human Performance Management – Fitness for Duty, Volume II: Managing Alcohol and Drug Use, version 2. January 2018.

This comprehensive approach, when fully implemented (i.e., including specific requirements and detailed guidance related to medical assessments, psychological evaluations and physical fitness assessments), is intended to formalize all aspects of human and organizational performance important to maintaining site safety and security. Supporting guidance materials that form part of the CNSC's Human Performance Management series of regulatory documents also cover human factors, personnel training and personnel certification.

Trucking Industry in Canada

Driver fatigue is a serious issue for commercial vehicle drivers in a 24/7 work environment that falls under provincial, territorial, federal and Canada-US cross-border jurisdictions. The industry has recognized that legislation alone is not sufficient; it needs to be complemented by other non-prescriptive programs, and the strategy needs to be endorsed by industry and governments alike.

In 2011, the Human Factors and Motor Carrier Safety Task Force produced a report containing more than 45 recommendations aimed at addressing fatigue, distraction and high-risk driving to mitigate the driver errors responsible for more than 90 per cent of heavy vehicle crashes.[94] Separately, collaborative work by Canadian and US regulators, carriers and researchers on a comprehensive approach to managing operator fatigue led to the July 2013 deployment of the Canada-US *North American Fatigue Management Program* (NAFMP), including recommended guidelines and training materials, all accessible on the NAFMP website.[95]

The potential benefits of using technology to assist in addressing the issue of driver fatigue is also recognized. Effective as of December 18, 2017, the US Department of Transportation is mandating the use of Electronic Logging Devices (ELDs) in commercial vehicles to track hours of service, which will require compliance by Canadian motor carriers and drivers while operating in the United States. In April 2017, work was completed on a Canadian ELD technical standard that leverages the work done by the US Federal Motor Carrier Safety Administration, while allowing Canada to meet its own regulatory requirements as per federal *Hours of Service Regulations and National Safety Code Standard 9*.

Transport Canada's Current Activity for the Rail Sector

In November 2017, Transport Canada issued a *Notice of Intent to Amend Railway Safety Regulations* (Notice of Intent)[96] to indicate its intention to make progress on the issue of fatigue management. To assist with this process, Transport Canada is spearheading a multimodal transportation forum on fatigue management, slated for spring/summer 2018. As fatigue management is not limited to the rail sector, the intent of the forum is to elicit input from other transportation modes.

This proposed approach is similar to that of civil aviation and is intended to provide a more robust fatigue management regime in the railway industry and cover a broader category of employees (i.e., not limited to operating crews on trains, but extended to other safety-related positions). It comprises proposed amendments and additions to the current prescriptive limits for operating employees, as well as fatigue management and fitness for duty requirements. To summarize the Notice of Intent, Transport Canada's suggested changes would capture the following:

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[93] **Canadian Nuclear Safety Commission.** REGDOC-2.2.4: Fitness for Duty: Volume II: Managing Alcohol and Drug Use, version 2. **December 2017. pp. 14-16.**

[94] **Thiffault, Pierre.** Addressing Human Factors in the Motor Carrier Industry in Canada. **May 2011.**

[95] **North American Fatigue Management Program.** Welcome to NAFMP. **Website.**

[96] **Transport Canada.** Notice of intent to amend Canadian rail safety regulations. **Canada Gazette. Part I: Vol. 151, No. 45. November 11, 2017.**

1. **Prescriptive requirements** — Consideration for new science-based prescriptive requirements integrating the latest in fatigue science for railway employees in safety-critical positions. In addition to scheduling and fitness for duty factors, the new requirements would assess limits relating to:
    - daily work periods;
    - minimum rest periods;
    - cumulative time on duty (weekly, monthly, annually);
    - daily split work periods; and
    - number of consecutive night duties.
2. **Fatigue management requirements** — Strengthened safety management system requirements for fatigue management through the inclusion of a framework for analyzing schedules for fatigue, developing fatigue countermeasures, as well as methods for applying fatigue science in rail operations.
3. **Fitness for duty** — Consideration for changes to the *Canadian Rail Operating Rules* that would emphasize responsibilities by individuals regarding fatigue management as well as greater detail with respect to fitness for duty. The rationale for this is that while the *Railway Medical Rules for Positions Critical to Safe Railway Operations, 2006* require frequent medical assessments for employees in safety-critical positions to determine their fitness for duty, many factors impact fitness for duty that may not be easily identified through a medical assessment (e.g., the consumption of alcohol or drugs, mental and physical health issues and fatigue).

Transport Canada's intention to develop a policy framework for the management of fatigue in the railway industry (both in the short and long term) that is scientifically defensible, inspired by best practices in the transportation sector and other industries, and includes the best available knowledge in fatigue science, is commendable. It is the Review's understanding that this would be accomplished through consultation and work with railway companies, unions, subject matter experts and other regulatory authorities.

What we have heard

Stakeholders have not expressed a unanimous desire for government action on the matter, given the work currently underway within the industry. Such work includes a joint initiative between the Teamsters Canada Rail Conference and CN that relies on analysis by a fatigue science specialist of activity-related data obtained through a Readiband™ device to help develop a crew-scheduling model that could help address some cases of fatigue (e.g., sleep-related fatigue).[97]

CP is similarly engaged with a fatigue science specialist to look at the issue.[98] Short lines have indicated, for the most part, that they have far fewer daily trains than the Class 1 railways, hence scheduling, fatigue and fitness for duty are not perceived as an issue.

While some have indicated that Transport Canada's Notice of Intent may be premature, given the industry initiative, others view the Department's approach as complementary, as it would create a fatigue-management regime that would include other categories of railway employees in addition to operating employees and apply consistently across the industry.

The Review also heard from a fatigue science specialist[99] how a robust fatigue risk management system can leverage differing levels of technology working in synergy in order to provide timely information regarding fatigue, namely:

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[97] CN Submission. p.31.

[98] CP Submission. p.25.

[99] Marquardt, Clinton. Interview with the RSA Review Panel. November 16, 2017. Ottawa, Ontario.

- Alerting Devices – Devices used as a countermeasure for fatigue at the moment it happens;
- Predictors – Wearable devices (e.g., Readiband™) providing information used by algorithms to predict the onset of fatigue; and
- Modellers – Programs (e.g., Fatigue Avoidance Scheduling Tool) allowing researchers, planners and schedulers to quantify the effects of various work-rest schedules on human performance and the corresponding operational impacts.

Drawing on inputs from these technologies allows for continuous adjustment of the FRMS.

Although few submissions received by the Review specifically addressed the issue of fatigue, those that did, support the modernization of the Canadian regime based on a scientific approach that takes into account empirical evidence and ongoing collaboration between all parties (i.e., the regulator, unions and industry).

Participants at the Dartmouth, Nova Scotia, roundtable thematic session were clearly supportive of a multi-facetted approach to address fatigue. They also emphasized that an approach built on collaboration also builds trust, which is a key element towards fostering a positive safety culture.

Over the past 20 years, the science relating to fatigue has continued to evolve to the point where certain key principles are now agreed upon by the scientific community. These include:

- sleep—an average of 7.5–8 hours per 24-hour period is required to sustain performance;[100]
- length of work period—work shifts should be no more than 12 hours, as the number of errors committed (compared to 8 hours on task) doubles after 10 hours and triples at 16 hours;[101]
- length of long rest period—two days off in seven days are required to counteract cumulative fatigue;[102] and
- consecutive night duties—the risk of making an error increases exponentially with each consecutive night of duty worked.[103]

Science also shows that human performance begins to degrade after 12 to 14 hours of wakefulness. This deterioration in performance has been demonstrated in laboratory studies and through the analysis of incident and injury rates and time of occurrence.[104] [105] As fatigue is both a complex and dynamic issue, an approach put in place today would need to be flexible to account for the many changes that are happening in fatigue science.

Considerations

The Review recognizes the recent actions undertaken by Transport Canada, unions and industry to address fatigue in the rail sector. This momentum needs to be sustained as the science is constantly evolving and fatigue management is now on the TSB Watchlist following years of limited progress.

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[100] Belenky, Gregory, et al. "Patterns of performance degradation and restoration during sleep restriction and subsequent recovery: a sleep dose-response study". *Journal of Sleep Research* 12, no. 1. 2003. pp. 1-12.

[101] Dorrian, Jillian, Baulk, Stuart D. and Dawson, Drew. "Work hours, workload, sleep and fatigue in Australian Rail Industry employees." *Applied Ergonomics* 42, no. 2. 2011. pp. 202-209.

[102] Dinges, David F., et al. *NASA Technical Memorandum 110404 - Principles and Guidelines for Duty and Rest Scheduling in Commercial Aviation*. National Aeronautics and Space Administration. 1996.

[103] Folkard, Simon, Tucker, Philip T. "Shift work, safety and productivity." *Occupational Medicine* 53, no. 2. 2003. pp. 95–101.

[104] Adamus, Dan; Booth, Jacqueline. Report of the Canadian Aviation Regulation Advisory Council (CARAC) Flight Crew Fatigue Management Working Group. August 15, 2012.

[105] Sleep Health Foundation. Fatigue as an Occupational Hazard. Fact Sheet. October 8, 2013. Website.

Fatigue in the railway industry is a complex issue that has safety implications for the national rail system, and one for which a simple solution does not exist. As in other high-hazard industries, the physiological limitations of railway workers, when considered within the operational requirements of railway companies, favour a flexible approach in combination with prescribed limits (to help ensure predictability of operations, and sufficient rest and recovery opportunities for workers).

Recommendation 3 – It is recommended that Transport Canada assume a leadership role on fatigue in the rail sector in order to set a flexible way forward that is in place in a timely fashion and includes:

A. working with employee representatives (unions), industry, and fatigue science specialists to develop a national approach to fatigue in the rail sector, including sustained collaboration between unions and industry; and

B. regulating prescriptive minimum criteria (that reduce the current number of on-duty hours and provide increased opportunities for rest) and non-prescriptive measures based on evolving fatigue science.

3) Technology and Innovation: A Major Opportunity for Now and Into the Future

Issue: Unclear focus and lack of sustained collaboration between research bodies, industry and federal departments is hindering development and adoption of more effective safety technologies

Challenge: Improving the capacity and ability of Transport Canada and the railway companies to evaluate, adopt and deploy new technologies that best enhance rail safety and efficiency in the Canadian context

The transportation sector continues to evolve at an ever-increasing pace, becoming more and more complex with changes largely driven by innovations in technology, including those stemming from Positive Train Control (PTC) legislation in the United States (US). Applying leading and emergent technologies could greatly improve the safety and efficiency of rail operations and industry oversight.

Technology continues to make a difference in managing risks related to rail maintenance and operations. The decline of track and equipment as causal factors in derailments, from 66 per cent in 2007 to 57 per cent in 2016,[106] can be largely attributed to railways investing in technologies and processes that enhance safety. Coupling technology with expanded data analytic capabilities is also becoming necessary to proactively plan operations and maintenance interventions that keep the rail transportation system running safely and efficiently.

Both industry and Transport Canada are testing promising imaging and drone technology for inspections of infrastructure and other difficult-to-reach areas. Additionally, fully automated passenger and freight trains are making their appearance world-wide, and autonomous road vehicles, with advanced vehicle-to-vehicle communications technologies, are on our doorstep.

High-speed passenger trains do not yet operate in Canada, however, Transport Canada is receiving questions from industry about the possible certification of European-designed passenger equipment for use on the Canadian rail network. Although safety standards for the construction and maintenance of such equipment exist abroad, these will need to be reviewed and evaluated for use in Canada.

While the *Railway Safety Act* (the Act) itself does not limit innovation and technology development, the Review received submissions and heard stakeholder concerns that suggest the issues surrounding technology adoption have not evolved since the 2007 *RSA* Review.[107] Namely, existing rules and regulations need to be modernized as they do not provide many options for using technology to more effectively and efficiently achieve the Act's safety objectives. In addition, Transport Canada needs to do more, including building internal capacity, to promote the development and use of safety-related technologies in rail operations. This has a direct impact on Transport Canada and how it conducts business now and into the future.

To respond to, and effectively leverage these opportunities, Transport Canada will need to change its role in order to actively promote and support adopting innovation and technology in Canada's rail sector. It will also be important for Transport Canada to have access to the skill sets and human capacity required to perform evaluations and assessments of unfamiliar technology.

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[106] CPCS. *Assessing the State of Railway Safety in Canada*. November 13, 2017. p. 30.

[107] 2007 *Railway Safety Act* Review. *Stronger Ties: A Shared Commitment to Railway Safety, Review of the Railway Safety Act*. November 2007. pp.169-179.

What has been done

Transport Canada's Rail Safety Program Activities Since the 2007 RSA Review

Transport Canada's response to the 2007 RSA Review's four technology-related recommendations[108] was to create a Working Group on Technology, and leverage a reconstituted Railway Research Advisory Board (RRAB) as a collaborative rail research and development (R&D) forum of industry, government and other stakeholders, to prioritize and drive research initiatives in technology and innovation. Other actions included: providing long-term, dedicated funding for rail safety R&D; involving universities in collaborative research and related educational initiatives; and establishing a rail research laboratory at the University of Alberta, in Edmonton.[109]

In 2011, the RRAB established eight priority areas for research[110] (reduced to six in 2014[111]), four of which are in strong alignment with current industry needs for technology development:

1. grade crossings and trespassing;
2. harsh and changing environments (e.g., winter and cold weather operations);
3. infrastructure (track performance and smart management of bridges); and
4. service efficiency and capacity.

In its "Rail Safety: Strategic Plan 2010-2015," [112] Transport Canada further addressed the recommendations of the 2007 RSA Review by adding a strategy to *"Facilitate New Safety Technologies and Harmonize Regulatory Requirements within North America."*

In January 2017, Transport Canada's Evaluation and Advisory Services completed an evaluation of the Transportation Development Centre's (TDC) rail R&D activities since 2009.[113] While recognizing the need and relevance of rail R&D and the role of the RRAB, the evaluation report also noted that the Department does not have a long-term project plan setting out specific rail R&D objectives and timelines. The three recommendations to Transport Canada focused on: participating more in the RRAB; developing and following a targeted, outcomes-based rail R&D plan; and introducing a knowledge management strategy for its rail R&D.

Canadian Railway Industry

Historically, railways, in partnership with suppliers, government and academia, have been actively engaged in developing and using innovative safety processes and technologies. Many of these safety technologies have increased the frequency and improved the quality of equipment and infrastructure inspections versus manual processes, and the results generally exceed minimum established regulatory requirements.[114]

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[108] 2007 *Railway Safety Act* Review. *Stronger Ties: A Shared Commitment to Railway Safety, Review of the Railway Safety Act*. November 2007. Appendix F, pp.214-215.

[109] Transport Canada. Evaluation of the Transportation Development Centre's Rail Research and Development. January 2017.

[110] Marc Prévost, *Update on RRAB Initiatives*. Presentation made at the Research and Development Conference: Innovative Solutions for a Changing Environment. October 2011.

[111] Transport Canada. Evaluation of the Transportation Development Centre's Rail Research and Development. January 2017. p.6.

[112] Transport Canada. Rail Safety: Strategic Plan 2010-2015. November 2010. p. 18.

[113] Transport Canada. Evaluation of the Transportation Development Centre's Rail Research and Development. January 2017.

[114] Railway Association of Canada Submission. Appendix B.

Some examples of safety technologies now in use by Canadian railways include:[115]

- advanced track geometry testing equipment to inspect lateral distance between rail, alignment, profile, etc.;
- ultrasonic detectors to identify sub-surface rail defects;
- electrical and mechanical equipment to predict rock slides in mountainous areas;
- acceleration detectors to identify movements resulting from rail joint issues and/or track geometry issues;
- optical track and tie imaging systems to inspect tie plates, joint bars, bolts and ballast;
- drones to detect track and bridge flaws;
- infrared and other wayside detectors (e.g., acoustic) to detect warm and hot bearings/wheels and dragging equipment;
- wheel impact load detectors to identify high wheel-rail impacts and imbalanced rail cars;
- wheel profile detectors to measure wheel profile and assess wheel integrity;
- truck hunting detectors to measure lateral forces or unstable bogies;
- advanced imaging systems to detect missing, damaged or worn rolling stock components; and
- automated brake testing capabilities.

The Railway Association of Canada (RAC) and its member railways also support rail safety technology development through the TDC, the Canadian Rail Research Laboratory at the University of Alberta, and participation in the RRAB.

Notwithstanding these technology initiatives, there is still potential for innovations in technology that can improve rail safety outcomes.

What we have heard

Despite Transport Canada's intent to facilitate the adoption of technology as indicated in its "Rail Safety: *Strategic Plan 2010-2015*", the message the Review heard through the roundtable sessions and submissions is that Transport Canada has been generally hesitant to support rail sector technology, including technology that has demonstrated value towards improving rail safety. This seems to be particularly the case if the long-term intent is for the technology to replace existing regulatory requirements that appear to be unnecessarily prescriptive and less effective than the improvements promised by technology. While the railway industry recognizes Transport Canada's efforts regarding technology and innovation, they also believe that the Department could further support the development and deployment of safety technology by reducing delays in the exemption and approval processes; and by recognizing that proven, effective technology can render some current regulatory requirements obsolete.[116]

CN provided an example of an innovative process it has been piloting related to continuous rail testing inspections that dramatically increases rail inspection coverage and quality.[117] These automated inspections could be carried out by either rail-bound test equipment or by a fleet of hi-rail vehicles (i.e., trucks capable of travelling on rails). The equipment would relay data in near real-time to a post-processing centre, which would help to identify and prioritize locations of rail that need maintenance or repair. CN could then assign maintenance crews according to the urgency of the needed repairs.

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115 Coleman, John. *Railway Safety in Canada - The Role and value-adding model of Transport Canada/Rail Safety in technology-based innovation. A framework for governance of safety in a sector that is steadily enabling itself with technology.* A report for the *Railway Safety Act* Review Panel. December 31, 2017. pp. 42-43.

116 Railway Association of Canada Submission. p. 23.

117 CN Submission. p.40.

According to CN, these methods would, with time, make it possible to follow the evolution of rail flaws, perform more predictive analysis, and plan maintenance accordingly to maintain safe and efficient operations. However, the proposed CN procedure does not conform to current stop-and-verify test procedures, in which every flaw detected by rail flaw detection equipment is hand-verified immediately. The CN proposal would introduce a 24-hour delay in hand-verifying a detected flaw, and until further validation is provided, Transport Canada is maintaining the requirement for stop-and-verify testing to be conducted, per regulatory minimum standards, in addition to the proposed technology deployment.

In a letter to the Review, CN noted that, "the party investing in innovation must have some assurance that when technological advancements generate improvements in safety, the regulator will not unreasonably delay or prevent their use." CN was also of the opinion that by supporting industry use of new advancements once a technology had matured, Transport Canada would see significant safety advancements.[118]

Participants at the roundtable sessions echoed submissions the Review received in that, Transport Canada needs to foster a technology-friendly culture within its ranks. Participants argued that it is currently not clear that any proposed technology will eventually receive approval or result in modification to current regulatory requirements. As a result, industry and its suppliers stated that they are hesitant to invest in innovation, as there is no predictable outcome. To support and encourage innovation and technology investments, many felt that the Department must create incentives for investment by recognizing that technology can, and should, replace out-dated manual inspection processes wherever possible.

CP gave an example where Transport Canada did provide the company a temporary exemption to the Rules,[119] allowing it to apply technology that assesses train brake effectiveness/operation on grades using wheel temperature detectors as an alternative to a static visual brake inspection. However, the company has been operating under this exemption for approximately seven years. CP argues that its proposed technology application has proven to be more effective than the visual brake test inspection and could be deployed across portions of its network, but Transport Canada's focus has primarily been on validating the company's results through the National Research Council, as opposed to focusing on expansion of the technology. CP's opinion is that, while this approach is prudent, Transport Canada should develop the capacity and capabilities to move such safety improvement opportunities forward more quickly. CP cites such prolonged hesitation as an example of how railway companies may be deterred from conducting further development or investment.

From the perspective of the railways, the main challenge is to increase timely support for technology innovations and, when effective and safe, to offset the costs of development and implementation by modifying other requirements. This would encourage investment in new technologies that improve safety as well as operational performance.

At the Calgary thematic roundtable session innovative companies with technology that could be adapted for rail use and industry suppliers indicated that to develop safety technology solutions they need: a clear direction from Transport Canada on which innovative technologies are a priority; a contact in the department to discuss innovative ideas; and a process that enables them to work with railways and Transport Canada early on the development of these potential technologies and their eventual incorporation into the regulatory regime. For example, it was noted at the discussion that with a clear expression of Government interest, technology suppliers could develop a variety of innovations to deal with grade crossing and trespassing issues.

Recommendation 13 in this Report specifically addresses this concern.

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[118] Letter from CN Vice-President, Safety and Environment to RSA Review Panel members. November 22, 2017.

[119] Transport Canada. *Railway Freight and Passenger Train Brake Inspection and Safety Rules*, TC O 0-184.

One of the outcomes of a review of rules and regulations as recommended by this Review is that it would also provide a level of predictability. Developers of safety technology should be able to clearly understand Transport Canada's objectives for proposed technology and the criteria it will use to determine equivalent levels of safety. They should also be able to reasonably predict whether the Department will accept the technology into the rail safety regime.

The Review also heard how mapping applications (e.g., Google Maps, Apple's iMaps, WAZE) available for personal tablets and smartphones could further help address certain proximity issues, and that the federal government should encourage all mapping applications in Canada to include railway crossing information. Of note, the US National Transportation Safety Board recently requested that technology companies provide audio and visual alerts to drivers encountering railway crossings in their mapping applications.[120] This request came following a tragic February 2015 collision between a truck and a commuter train in California, where the driver ended up stuck on the railroad track after following directions his smartphone mapping application gave him. Soon after the driver abandoned the truck, a commuter train struck it, killing the engineer and injuring 32 others.[121]

While most of the input the Review received favours increased innovation and implementation of technology to advance rail safety, not all submissions or comments echoed this approach. Some contributors cautioned that removing the human element by increasing technology would reduce rail safety. Others felt that technology is solely used in a reactive fashion to reduce front line railway personnel, so the only effective approach to improve safety would be to increase the number of inspectors (and inspections) in the field. Finally, the Review heard about the importance of taking ergonomics into consideration when installing new technology in locomotive cabs, so that the technology itself does not distract train operators.

It was also clear to the Review that technology that enhances human performance will also enhance safety, particularly as human performance is not limited to railway employees. Extending the concept to others who may interact with the railway network, technology that impacts human behaviour at crossings and along rail lines can also help address long-standing issues related to proximity and crossings.

For example, in the case of vehicle-to-vehicle communications technologies, these could potentially be adapted to support train-to-vehicle messages or alerts near railway crossings (e.g., reduce grade-crossing incidents by increasing driver and train operator awareness).

Additionally, the Transportation Safety Board of Canada (TSB) has consistently identified human actions as a contributing element in rail accidents. Technology that improves human performance (such as infrared or acoustic sensors that can yield better information than the naked eye), provides a significant opportunity for improving safety because of its potential to ensure consistency. For example, when used to inspect track or equipment, technology can provide a frequent and reliable account of the track or equipment condition, without being affected by weather or fatigue in the same way that people may be affected.

Areas where Review respondents thought technology development and deployment would be most beneficial are:

- technology that assesses train-in-motion conditions (as compared to a static assessment);
- autonomous track inspections;
- technology that monitors individual components of rolling stock;
- technology that helps enhance human performance;

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[120] United States. National Transportation Safety Board. Safety Recommendation H-16-015. December 19, 2016.

[121] Of note at the time of the writing of this report, personal GPS units have started to appear on the Canada-US market that include driver alerts for rail crossings and animal crossings. Additionally, the Railway Association of Canada has collected crossing location data as part of its Canadian Rail Atlas project, and could make this information available to technology and delivery companies for application development.

- in-cab technology that helps operators; and
- predictive analytics.

3.1 The Role of Transport Canada in Rail Safety Technology

The Review commissioned a study to further assist its analysis and determination of the potential role of Transport Canada in technology and innovation. In brief, the study indicates there is a significant and important role for the Department as a facilitator of innovation. The study suggested that Transport Canada take an active role in six areas relating to technology:[122]

1. constantly pursue higher-level safety indicators that technology can address;
2. set standards and criteria for evaluating safety equivalence;
3. keep rules and regulations current by adapting them to recognize advances in technology;
4. champion experiments and pilot projects;
5. challenge and evaluate proposed technology to demonstrate to the public that the technology will benefit rail safety (i.e., judging proposed technology); and
6. sponsor selected technology initiatives (i.e., co-sponsor, with unbiased partners, pilot projects with the potential to benefit the rail system as a whole).

A common thread in the successful adoption of many new technologies has been the combined involvement of the regulator, industry, and academia in their development. A most notable example is the Railway Ground Hazard Research Program (partners include CN, CP, the National Research Council, and the University of Alberta). Formed in 2002, it continues to be very active in developing, reviewing and integrating technologies, such as fibre optics and ground penetrating radar, into predictive models for ground hazard assessments.

In parallel, evaluating equivalent levels of safety based on defined criteria and acceptable safety improvement targets, or rates of progress, will enable the Department to progressively modernize the 'minimum regulatory requirements' (i.e., moving the floor)[123] without stifling innovation. This will help ensure continuous improvement in the safety of the rail network that benefits Canadians.

Research also indicates that future progress in rail safety technology will probably draw on developments in computational processes, mathematics, communications network architecture,[124] heuristics, data analytics, artificial intelligence and obsolescence management.[125]

3.2 Stimulating Technology and Innovation

Technology changes are inevitable. Transport Canada needs to acknowledge and be prepared for these changes, or its rail safety oversight regime risks being left in a state of 'shrinking relevance', as companies implement technologies that far exceed existing, prescriptive regulatory requirements.[126]

Transport Canada needs to develop a technology vision and strategy for its Rail Safety Program that would include clear objectives for the technology being introduced (e.g., reduction of emissions, reduction of crossing accidents, implementation of train control). This could, in turn, be one of the criteria used to help the Department prioritize the order of rules and regulations it reviews. For example, if a proposed technology is clearly a 'building block' towards a stated objective of the Department's overarching technology strategy, it should encounter fewer barriers towards regulatory adoption.

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[122] Coleman. *Railway Safety in Canada*. pp. 78-79.

[123] Coleman. *Railway Safety in Canada*. p. 80.

[124] Vinodrai and Associates, Inc. Railway Association of Canada. *Canadian Rail Communications: Beyond 2020*. October 2017. pp. 7-16.

[125] Coleman. *Railway Safety in Canada*. p. 71.

[126] Coleman. *Railway Safety in Canada*. p. 55.

In the context of new technologies, it is important for Transport Canada to be involved early. This will put the Department in a position to assess the safety of proposed technologies before they enter the marketplace and drive technological improvements to enhance safety in areas where risks remain high.

To summarize, seizing the safety enhancement opportunities technology and innovation present to the rail sector requires Transport Canada's Rail Safety Program to:

- define a vision (i.e., establish a quantitative target for improved safety, such as a defined percentage reduction in accident rates or a maximum-allowable failure rate within a defined period, supported by measurable performance indicators to get there[127]);
- establish a governance model and processes that promote the development and adoption of technology;
- remove regulatory impediments to innovation (e.g., creating nimble rules/regulations with accelerated exemption processes); and
- build capacity in technology evaluation, data analytics, including predictive analytics and human behaviour, to better understand industry trends.

Considerations

To advance rail safety, Transport Canada's role as it relates to rail sector technology, must be one of facilitator of innovation and adoption. The Department has begun taking steps that align with such a role by launching its Innovation Centre in 2018. The Centre will work to:

- create stronger capacity within Transport Canada to anticipate technological change;
- share expertise in technology and research;
- identify innovative regulatory solutions;
- influence technology development; and
- act as a hub to stimulate and support innovation across all transportation modes.

With such a clear message, modal directorates will have to develop strategies in support of the Department's direction that incorporate innovation and technology into their oversight roles. In the case of rail safety, this will also require revising the Rail Safety Program's mandate to better support this new role.

The role of facilitator aligns well with the legislated authority under Section 3.1 of the Act, which indicates that Transport Canada may undertake and cooperate with persons undertaking technical research or study to support its rail-related responsibilities. Industry will continue to undertake technological development that has safety repercussions. Transport Canada needs to recognize the important and expanding role technology plays in advancing rail safety, and the important and expanding role it, as the regulator, must play in challenging, evaluating, and adopting emerging technologies, so as to ensure that introducing them into rail operations will improve the safety of the entire rail system for Canadians.

In fact, Transport Canada's *Transportation 2030: A Strategic Plan for the Future of Transportation in Canada*, with its focus on safe, secure, green, innovative and integrated transportation, is already a catalyst for innovation in the passenger/commuter rail sector. Service providers are aggressively looking at technology options to help achieve the goal of high-frequency, integrated rail travel, including the potential to use existing European-designed rail equipment. Given the differing equipment standards between North America and Europe, Transport Canada is facing increasing pressure to adapt its role in order to evaluate and certify this 'non-standard' to North America rail equipment for use in Canada.

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[127] Coleman. *Railway Safety in Canada*. pp. 89-90.

Both industry and Transport Canada need access to greater capacity and specialized competencies in:

> "We have to be technology leaders to do our job."
>
> *Rail Safety Inspector*
> *Transport Canada*

- science and technology to assess emerging technologies' feasibility to meet or exceed existing levels of safety in regulatory requirements;[128] and
- predictive analysis, to use the data technology produces for inspection planning and incident prevention.

The Department will likely need to financially support its Rail Safety Program in acquiring the necessary capacity to achieve this role. A strong first step in determining resource gaps and required skill set profiles would be to consult with other organizations such as the Civil Aviation Directorate, the National Research Council, or the Transportation of Dangerous Goods Directorate,[129] to determine how they have assessed and addressed their need for science, technology, and predictive analytics capacity.

Recommendation 4 – To capitalize on the potential for safety improvements that can be derived from technology and innovation in the rail sector, it is recommended that Transport Canada facilitate the development and adoption of rail safety technology by:

A. strengthening its capacity in the areas of technology evaluation and data analytics in the rail sector, including the proactive use of data analysis;

B. articulating a strategic outlook, research direction and objectives that would be used to evaluate existing and new technologies that enhance rail safety and provide predictability to industry to make investments in innovation;

C. leveraging relationships with research-oriented organizations to target research on human performance and inspection quality; and

D. ensuring exemptions granted for testing purposes under Section 22.1 of the Railway Safety Act include provisions for the testing data collected to be provided to Transport Canada for the purposes of regulatory development or additional research.

3.3 Enhanced Train Control: An Opportunity to Lead

While the Review sees Transport Canada's role as a facilitator of technological innovation and adoption, the Department will also need to lead in some specific areas for innovation to occur.

Enhanced Train Control (ETC) refers to systems and technologies designed to ensure safe train operation in the event of human error. ETC installations can vary greatly in cost and complexity, depending on the desired level of automation.

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[128] Coleman. *Railway Safety in Canada*. pp. 78-87.

[129] Coleman. *Railway Safety in Canada*. p. 44.

Positive Train Control (PTC), is a particular type of ETC that is designed to prevent train-to-train collisions, derailments caused by excessive speeds, unauthorized incursions by trains onto sections of track where repairs are being made, and movements of trains through a track switch left in the wrong position. However, PTC is not designed to address trespassing or grade crossing fatalities or accidents caused by broken rails, among other things.

PTC came to the forefront following a series of fatal rail accidents in the US between 2002 and 2008, most notably the head-on collision between a Metrolink commuter train and a Union Pacific freight train in Chatsworth, California on September 12, 2008, which resulted in 25 fatalities and the transport of 102 injured passengers to hospital.[130] This led to the US *Rail Safety Improvement Act* of 2008, which mandated railways to develop and install PTC by December 31, 2015. The US Congress has extended this deadline due to implementation complexities, although recent events (i.e., AMTRAK derailment, December 2017) have prompted renewed calls for PTC to be fully operational in the US no later than December 2018.[131]

The Transportation Safety Board of Canada (TSB) has made two recommendations to Transport Canada regarding train control:

> R00-04: The Department of Transport and the railway industry implement additional backup safety defenses to help ensure that signal indications are consistently recognized and followed.[132]
>
> R13-01: The Department of Transport require major Canadian passenger and freight railways to implement physical fail-safe train controls, beginning with Canada's high-speed rail corridors.[133]

Recommendation R00-04 followed a rear-end collision of two CP trains in British Columbia in 1998 that resulted in no injuries. Recommendation R13-01 followed a main track derailment of a VIA Rail train near Burlington, Ontario in 2012, in which the operating crew died and 45 people were injured.

In addition, between January 2007 and December 2016, the TSB was notified of 344 occurrences of trains exceeding their limits of authority as a result of inappropriate crew responses to signal indications displayed in the field. In each of the 14 occurrences it investigated, the TSB determined the misperception of wayside signal indications by an operating crew member to be a cause or a contributing factor. The most notable of these occurrences led to Recommendation R13-01 mentioned above.

Although the process for developing and implementing complex technology in the rail sector can be long (e.g., over 10 years in the case of PTC), train control has a definite role to play in rail safety by reducing human actions as contributing factors in accidents.

Transport Canada needs to firmly move in this direction with a proper, research-driven regulatory framework that avoids a one-size-fits-all model, and supports innovation by enabling the use of open standards and software. Lessons learned from the US experience with PTC, including the challenges imposed by 'innovation by regulation', can help Canada adopt train control technology within a reasonable timeframe.

Transport Canada needs to work towards train control implementation by first establishing a train control strategy and then identifying the involvement required by railways, the Department and other federal departments to help implement the strategy.

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[130] **United States. National Transportation Safety Board.** Collision of Metrolink Train 111 with Union Pacific Train LOF65-12 [RAR-10-01]. **January 21, 2010.**

[131] **Tribune Content Agency.** "House bill would require train stopping technology, following Washington Amtrak derailment." **Daily Republic. January 18, 2018.**

[132] **Transportation Safety Board of Canada.** Railway Investigation Report R98V0148. **April 24, 2013.**

[133] **Transportation Safety Board of Canada.** Railway Investigation Report R12T0038. **February 18, 2016.**

Transport Canada's pursuit of collaborative research in ETC technologies and developments for the Canadian context would help focus R&D on a suite of technologies (i.e., train control 'building blocks') which, when overlaid, comprise ETC. In focusing on technologies that support ETC as a whole, and not limited to PTC as a specific form of train control, there is an opportunity to design a cost effective system tailored to the Canadian rail network that:

- is scalable to the size and technical capabilities of individual railway companies (i.e., short line or Class 1);
- provides safety enhancements at successive levels of implementation; and
- applies to transportation modes beyond rail.

A strategic outlook and research direction that specifically identifies and targets train control as a category of technologies would send a strong signal that Transport Canada is ready to facilitate and accelerate innovation in rail safety technology in a focused area. The timing for such a strategy is also appropriate, given that:

- CN and CP continue to install, test and approve the PTC technologies for their US operations, thereby gaining insights into what systems and technological options would provide the greatest safety benefit for Canada;
- two major passenger railways (GO Transit and VIA Rail) have voluntarily begun planning for using a form of train control on the lines they own. Whether it is Communication Based Train Control (CBTC) or a GPS overlay, the railways expect these systems to provide service efficiency benefits in addition to safety benefits;
- A study of 'train control technologies and their suitability for Canada's railway operations with a special focus on the high-speed rail corridors' was completed in 2016 by a working group established under the Department-led Advisory Council on Rail Safety;[134] and
- Transport Canada has contracted the University of Alberta's Canadian Rail Research Laboratory to study the feasibility of implementing various levels of train control in Canada.

The technologies required to implement the strategy would likely need to incorporate assessments of train-in-motion conditions with in-cab technologies that enhance human performance, in addition to GPS overlay, as well as leveraging communications required for the Internet of Things.[135]

Focusing on train control solutions may yield benefits in other areas, as well. For example, whether it is automated vehicles or trains, drones or Enhanced Train Control, a reliable wireless backbone and appropriate radio spectrum is required for data and voice communication. As such, improved communications technology developed for ETC may provide innovative solutions for increasing safety in areas without signalization (i.e., dark territory).

Dedicated radio spectrum is vital for putting an effective train control strategy in place across the national rail network. Spectrum, however, is in high demand, and individual railway companies cannot ensure sufficient bandwidth is available to meet their identified communication needs for high-speed mobile data and radio spectrum.[136]

A shared broadband network to support multi-modal transportation safety solutions requires a national approach, and engagement with multiple federal departments (e.g., Innovation, Science and Economic Development Canada or ISED, and Public Safety Canada). Transport Canada has recognized this and has established a Memorandum of Understanding with ISED in an effort to identify and secure additional spectrum before technologies are rolled out. Exercising this kind of leadership is critical to ensuring the spectrum required for a railway company to implement train control is always available.

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[134] **Transport Canada.** Train Control Working Group Final Report. Presented to the Advisory Council on Railway Safety. **September 2016.**

[135] The Internet of things is a network of physical devices, vehicles, and other items which are able to connect and exchange data. It allows objects to directly integrate the physical world into computer-based systems, resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

[136] Vinodrai and Associates, Inc. Railway Association of Canada. *Canadian Rail Communications: Beyond 2020*. October 2017. pp. 16-20.

Given all of the above, the Review believes that the time has come to move the rail sector into a more modern era, in step with other transportation modes.

Recommendation 5 – It is recommended that Transport Canada, in partnership with industry, develop a Canadian approach to enhanced train control (ETC) technologies and establish a technology road map for implementing ETC in a staged and cost-effective manner.

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4) Proximity Issues: A Shared Responsibility

Issue: Proximity issues are the biggest cause of death and serious injuries in rail transportation, and current trends suggest the situation is likely to get worse without intervention

Challenge: Transport Canada taking on a leadership role to address these issues and improving collaboration with railway companies and other levels of government, to facilitate sustained change

The inter-related issues of growing proximity of communities to rail operations and the exceptionally high numbers of deaths and major injuries due to trespassing and grade crossing accidents are major persistent issues for public safety in Canada. These issues were recognized by the 2007 RSA Review.[137] Little progress has been made in reducing the frequency of these accidents since that time, as highlighted by the 2015 *Canada Transportation Act* Review.[138]

The Review Panel members saw many examples during site visits of apartment buildings and sports facilities constructed near rail lines. This development increases the interactions of pedestrians and vehicles with trains, elevating safety risks as well as raising concerns from the public about rail noise and vibration.

Progress on these issues seems to be plagued by a number of factors, including: unclear jurisdiction; a lack of a strong federal role to facilitate action; and insufficient collaboration among provincial/territorial and municipal governments and railways regarding land use and trespassing near rail operations.

Given that these proximity issues are likely to get worse in the future due to more intense urbanization, increased rail traffic and more interaction of citizens with rail crossings, the Review has concluded that bold action is required to address these inter-related issues, including the clarification of the federal authority regarding proximity and safety standards in close proximity to rail operations.

Between 2007 and 2017, accidents at grade crossings and trespassing on railway properties accounted for more than 91 per cent of all fatalities and approximately 79 per cent of all serious injuries related to rail transportation. Specifically, this means that 499 people died and 212 people were seriously injured over this period due to trespassing on railway property, and 259 deaths and 282 people seriously injured at grade crossing accidents.[139] The annual rate of accidents, fatalities, and injuries at grade crossings and from trespassing is not declining, unlike trends seen in other types of rail accidents (see Figures 10 and 11).

The statistics currently available in Canada "do not necessarily capture the full human, economic and environmental consequences" of railway crossing accidents.[140] In addition to property and/or environmental damage, accidents and fatalities take a devastating psychological and social toll on the people involved, their families and friends, as well as on railway personnel, first responders, passengers, witnesses to the accident and the community in general. In particular, locomotive operators may suffer from health issues, such as anxiety and sleep problems.[141] These accidents also incur direct costs for emergency services, investigations, remediation of damaged property and/or environmental impacts of releases of dangerous goods, insurance administration and legal proceedings. Grade crossing accidents may result in delays in the movement of people and goods through these points by road and rail for a period of time ranging from 30 minutes to several hours.[142] In some cases, such occurrences may block grade crossings, which can limit access for emergency vehicles and school buses, among other vehicles.

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[137] 2007 *Railway Safety Act* Review. *Stronger Ties: A Shared Commitment to Railway Safety, Review of the Railway Safety Act*. November 2007. p. 107.

[138] 2015 *Canada Transportation Act* Review. Pathways: Connecting Canada's Transportation System to the World, Volume 1. December 2015. p. 143.

[139] Transportation Safety Board of Canada. Statistical Summary – Railway Occurrences 2016. Tables 1 and 2; Transportation Safety Board of Canada. Monthly rail occurrence statistics – 2017. Table 1.

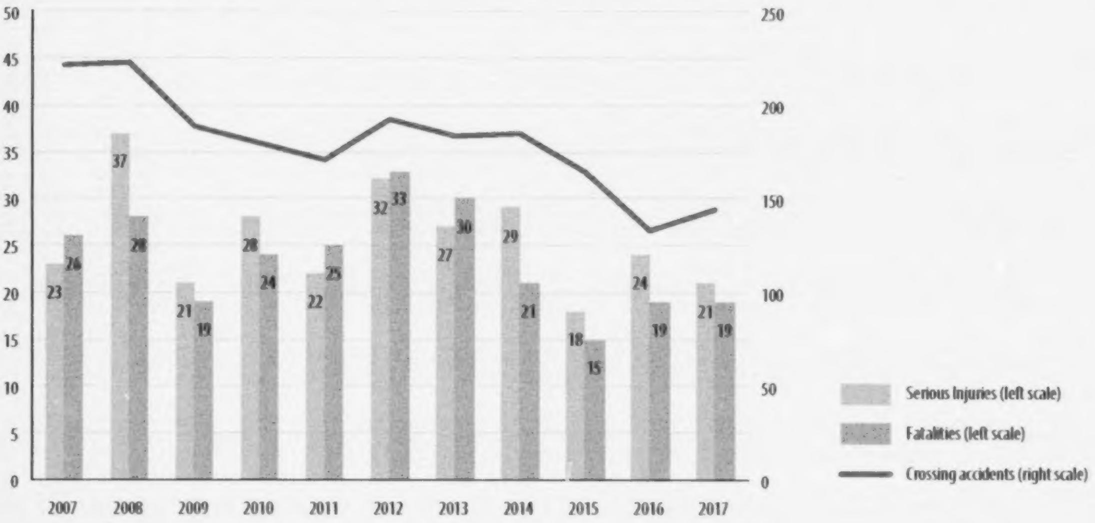
[140] CPCS. *Assessing the State of Rail Safety in Canada*. p. 4.

[141] Havârneanu, Grigore M., Burkhardt, Jean-Marie and Paran, Françoise. "A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents." *Accident Analysis and Prevention 81*. 2015. pp. 30–50.

Failure to take rail safety into consideration when making land use planning decisions can lead to the incompatible use of land adjacent to railways, an increased use of grade crossings (including pressure to open new grade crossings), and an increased likelihood that people will trespass on railway property. The combination of these factors increases the risk of collisions between trains and people.

The risks associated with developments near rail lines, grade crossings, and trespassing are a major concern for all rail safety stakeholders in Canada, including railway companies, the federal government, the provinces/territories, Indigenous communities, municipalities and the general public.

FIGURE 10: GRADE CROSSING ACCIDENTS, SERIOUS INJURIES AND FATALITIES 2007-2017[143]



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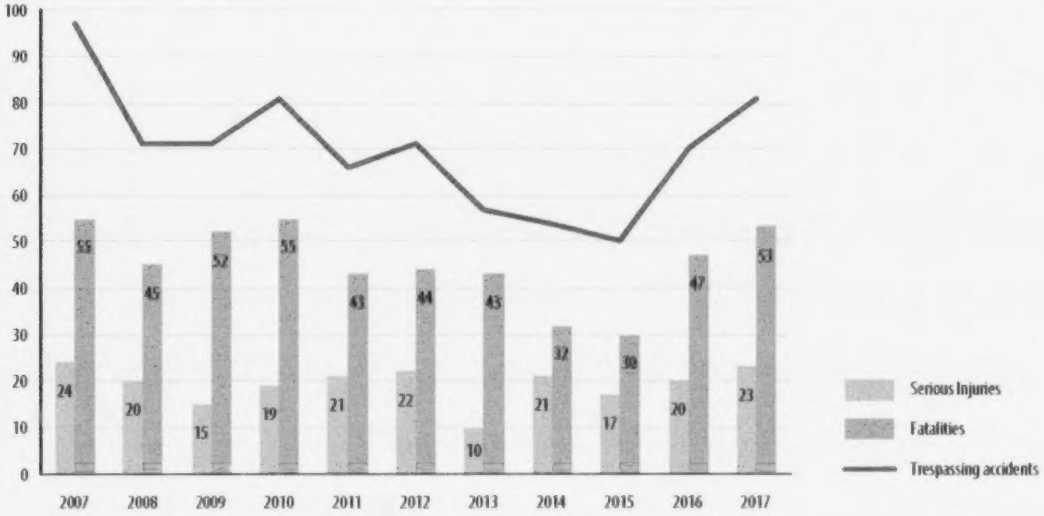
142 Havârneanu, Grigore M., Burkhardt, Jean-Marie and Paran, Françoise. *"A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents." Accident Analysis and Prevention 81*. 2015. pp. 30–50.

143 Transportation Safety Board of Canada. Statistical Summary – Railway Occurrences 2016. Tables 1 and 2; and Transportation Safety Board of Canada. Monthly rail occurrence statistics – 2017. Table 1

Figure 11: Trespassing Accidents, Serious Injuries and Fatalities 2007-2017[144]



4.1 Grade Crossing Safety

Transport Canada defines a grade crossing as "an intersection where a road or path crosses railway tracks at the same level."[145] It is the only location where it is legal and safe for pedestrians, cyclists and vehicles to cross railway tracks, and the law requires that road users give right-of-way to the train. Grade crossings may be public, meaning that the roads are the responsibility of public authorities, such as a province/territory or a municipality, or private, meaning that the road is owned and operated by private persons, such as farmers, businesses or individuals.[146]

According to official data from Transport Canada, there are approximately 23,000 grade crossings under federal jurisdiction in Canada, of which 14,000 are public and 9,000 are private, spread over more than 40,000 kilometres of rail lines under federal jurisdiction.[147] The current approach to managing grade crossing safety in Canada requires the cooperation of over 3,000 municipal, provincial, territorial and federal authorities and Indigenous Groups,[148] and thousands of private land owners (with many different types of roads, including residential, agricultural, industrial, commercial, and recreational paths and trails) involved, in addition to approximately 32 railway companies.[149]

The economic and social importance of railway crossings for regions and communities that are intersected by railways is indisputable. Crossings promote the flow of goods and people and access to neighbourhoods, regions and services, such as work, schools and hospitals. However, grade crossings can be the site of fatal accidents, such as the collision between a VIA Rail train and a car that occurred in Southwest Middlesex County, Ontario, on April 4, 2016, resulting in the death of two people.[150]

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[144] Transportation Safety Board of Canada. Statistical Summary – Railway Occurrences 2016. Tables 1 and 2; and Transportation Safety Board of Canada. Monthly rail occurrence statistics – 2017. Table 1.

[145] Transport Canada. Grade Crossing Safety. Website.

[146] Transport Canada. Grade Crossings Regulations. What you need to know. Catalogue No.: T86-16-2016E-PDF. 2016.

[147] Transport Canada. *Grade Crossing – Handbook*. December 14, 2016. Website.

[148] Transport Canada. *Grade Crossing – Handbook* December 14, 2016. Website.

[149] Transport Canada. Regulatory Impact Analysis Statement – Grade Crossings Regulations. Canada Gazette, Part II: Vol. 148, No. 26. December 17, 2014

[150] Drouin, E. « Collision mortelle au 4e passage à niveau jugé le plus à risque au Canada ». Article, ICI-Toronto, Radio-Canada. April 13, 2016.

What has been done

Transport Canada's Activities Since the 2007 RSA Review

Deemed to be a critical issue for public safety in Canada, grade crossing safety has been the subject of a number of reports.

In 2009, the Transportation Safety Board of Canada (TSB) recommended grade crossing assessments in the Quebec City–Windsor passenger corridor.[151] In response to the tragic collision between a VIA Rail train and an OC Transpo bus in Ottawa, Ontario, on September 18, 2013, which resulted in 6 fatalities and 34 injuries, the TSB recommended that specific guidance be provided as to when to consider the development of grade separations instead of level crossings.[152] In the Fall 2013 Report, the Auditor General of Canada stated that Transport Canada should accelerate the resolution of six important and long-standing safety issues raised by stakeholders in the past 5 to 20 years, including trespassing and grade crossings.[153] The Standing Committee on Transport, Infrastructure and Communities also addressed the issue of railway crossing safety in its June 2016 Report, *Report 6 - An Update on Rail Safety*. In particular, it recommended that effective signage and/or other safety measures be required at unmarked passive railway crossings and that the cost of these modifications not be placed upon local governments or ratepayers.[154]

Transport Canada has taken a series of measures intended to strengthen grade crossing safety that take into consideration the conclusions reached by the 2007 RSA Review, and the recommendations of other authoritative reports on the same topic. These efforts include the regulatory changes and investments in rail safety discussed below.

At the regulatory level, Transport Canada establishes safety standards for grade crossings under the authority of the *Railway Safety Act*, in addition to playing a key role in evaluating their safety. The *Grade Crossings Regulations* are intended to enhance the safety of grade crossings under federal jurisdiction through a clear definition of the roles and responsibilities of railway companies and road authorities with regard to: information-sharing; crossing surfaces; sightlines; road and railway signs; traffic lights; and warning systems.

In April 2016, in response to public demand for more transparency about grade crossings in Canada, the Minister of Transport made an inventory of grade crossings available to the public, organized according to risk factors.[155]

With regard to available funding, grade crossing improvements are eligible for funding under the Rail Safety Improvement Program (RSIP) announced by Transport Canada in October 2016. The Program is investing $55 million over three years, with the objective of reducing the number of injuries and fatalities related to rail transportation and, at the same time, increasing public education and awareness of rail safety issues across Canada.

Transport Canada plans to invest over $20 million in each of the years of 2017-18 and 2018-19 under the RSIP to fund initiatives to improve rail safety. These measures include infrastructure improvements (e.g., grade crossing signals and gates), the use of innovative technologies and research, education and awareness and the closing of grade crossings. Infrastructure, technology and research projects submitted by not-for-profit organizations, including municipalities, are eligible for cost-sharing of project costs of up to 80 per cent in federal funding. However, for the elements of the projects where the work is the responsibility of the railway company (i.e., a for-profit entity), they are only eligible for up to 50 per cent. Grade crossing closure funding is limited to $25,000 for public crossings and $6,000 for private crossings. Education and awareness projects are eligible for federal funding of up to 50 per cent of project costs.[156]

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[151] **Transportation Safety Board of Canada.** Reassessment of the Response to Rail Safety Recommendation R09-01: Assessment of level crossings. **Website.**

[152] **Transportation Safety Board of Canada.** Reassessment of the Response to TSB Recommendation R15-04: Grade separation guidelines. **Website.**

[153] **Auditor General of Canada.** *Report of the Auditor General of Canada: Chapter 7 Oversight of Rail Safety–Transport Canada.* **Fall 2013. paragraph 7.29.**

[154] **Standing Committee on Transport, Infrastructure and Communities.** *Report 6 - An Update on Rail Safety.* **June 2016. Recommendation 9. p. 13.**

[155] **Transport Canada.** Grade Crossings Inventory. **Website.**

International Approaches

Internationally, the Review found a trend toward closing grade crossings and, in some cases, replacing them with grade separations.

In the United Kingdom, for example, there are currently approximately 6,000 grade crossings, down from 27,000 in 1946. This decrease is the result of the closing of rail lines and long-term policies aimed at reducing the number of grade crossings.[157] [158] Since 2007, Great Britain's Office of Rail and Road has followed a policy that prohibits the creation of new grade crossings, except in "very exceptional circumstances."[159] Moreover, the Network Rail, an independent public sector body that operates, maintains, develops and improves rail infrastructure in Great Britain, Wales and Scotland, also follows a "no new grade crossing" policy. Since 2010, Network Rail has had a risk reduction program whose objective is to close and/or upgrade "high-risk" level crossings across its railway network. Since the launch of this program, over 1,000 crossings have been closed and safety improvements have been made to a dozen others.[160]

Italy is another country that, since the 1980s, has massively eliminated grade crossings and replaced them, when possible, with grade separations.[161] It has considerably reduced the number of its grade crossings from 16,000 at the end of the 1980s, to 4,620 in 2016, a decrease of 71 per cent. Further, new rail lines are being built without grade crossings.

What we have heard

Grade crossing safety is the major issue raised throughout the consultations, at roundtable sessions the Review held across Canada, as well as in stakeholder submissions. These comments can be grouped into four categories: the funding of improvements to grade crossing safety; compliance with *Grade Crossings Regulations*; the governance approach to grade crossings; and transparency and technology.

Funding of Improvements to Grade Crossing Safety

During the consultations, a common message to the Review was that the funding granted under the RSIP of $55 million over three years was too limited to have a significant impact on the improvement of rail safety, particularly grade crossing safety. Many stakeholders argued that RSIP funding was insufficient to meet the needs and new mandated requirements for improvements to grade crossing safety. It was noted that grade crossing improvement initiatives must now compete against other initiatives such as research and outreach, given that the Rail Safety Improvement Program is broader than the Grade Crossing Improvement and Grade Crossing Closure Programs that preceded it.[162]

There was a consensus among stakeholders that improving grade crossing safety requires new and additional public funding. Stakeholders indicated that this new funding should be provided to promote the closing of grade crossings, the upgrading of existing railway crossings and the construction of grade separations. This would not only increase safety, but also reduce congestion and bottlenecks on roads and railways.[163] It was emphasized that the anticipated increase in trade volumes over the coming decades is expected to result in more and longer trains, and pressure for additional capacity within existing trade corridors.

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[156] Transport Canada. Rail Safety Improvement Program RSIP-ITR Applicant's Guide. Website.

[157] Network Rail. Level Crossing Safety. Website.

[158] Evans, Andrew W. "Fatal Accidents at Railway Level Crossings in Great Britain 1946–2009." *Accident Analysis and Prevention* 43. 2011. p. 1839.

[159] United Kingdom. Office of Rail Regulation. Railway Guidance Document – RGD-2014-06. December 2014. pp. 2-3.

[160] Network Rail. Reducing Risk at Level Crossings. Website.

[161] Mazzola, Alberto. "Level Crossing Safety in Italy." Presentation at the International Level Crossing Awareness Day Conference in Montreal, Quebec, June 2, 2017.

[162] CP Submission. p. 33; CN Submission. p. 58.

The Railway Association of Canada (RAC) estimated a cost of $1 million to improve a grade crossing through the installation of equipment, such as lights, gates and bells, $20 million to build a simple grade separation in a rural area and over $60 million for a more complex structure in an urban area.[164] The City of Ottawa estimated the cost of building five grade separations in the suburb of Barrhaven at approximately $430 million.[165] Moreover, Infrastructure Manitoba reported that the cost for the construction of two grade separations in Winnipeg was over $200 million.[166]

In the US, the Railway-Highway Crossings Program grants US$1.3 billion in funding over five years (i.e., 2016 to 2020) to eliminate the risks related to its 250,000 grade crossings across the country. For example, the US Federal Highway Administration (FHWA) obtained US$350 million from this fund in 2016. The FHWA indicates that this program has had a positive impact on rail safety, given the reduction in the number of deaths at railway-highway crossings by 57 per cent since the program's inception in 1987 through 2014.[167]

A number of stakeholders suggested that there should be an integrated rail corridor-based approach focused on both crossing safety and the efficiency of rail corridors.[168] The Government of Saskatchewan asserted that "[i]n order to ensure a better quality of life for Canadians, rail safety and operational efficiency must be balanced."[169]

In many cases, improving the efficiency of the transportation system also has important safety benefits. Yet it is notable that safety is not a defined eligibility/merit criterion for major federal infrastructure programs, such as:

- the transport-focused National Trade Corridors Fund (NTCF) totalling $2 billion over 11 years;
- public transit funding of $20.1 million over 10 years;
- Canada Infrastructure Bank funding of $35 billion over 10 years; and
- the Gas Tax Fund (GTF), totalling $2 billion per year (subject to provincial/territorial and/or municipal identified priorities).[170]

An integrated rail corridor-based approach as suggested by stakeholders above, could be built into existing and future infrastructure funding programs, by giving higher consideration to projects that can demonstrate a measurable impact on improved safety in addition to increased efficiency.[171] This approach could be explored for the construction of grade separations in particular, which not only increase safety but also reduce traffic congestion due to crossing delays.

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[163] CP Submission. p. 33; Manitoba Infrastructure Submission. p. 6; RAC and CUTA Submission. p. 2; Government of Alberta Submission. p. 10.

[164] Railway Association of Canada Submission. p. 17.

[165] Willing, J. "Separated rail crossings in Barrhaven area would cost $430M." Ottawa Citizen. May 17, 2017.

[166] Manitoba Infrastructure Submission. p. 6.

[167] Federal Highway Administration. US Department of Transportation. Railway-Highway Crossings (Section 130) Program. Website.

[168] CP Submission. p. 33; CN Submission. p. 60; Government of Alberta Submission. p. 10; RAC and CUTA Submission. p. 2; RAC Submission. p. 18.

[169] Government of Saskatchewan Submission. p. 8.

[170] The City of Milton, Ontario, has already built a grade separation that was partially funded by the Gas Tax Fund. Source: Town of Milton. Town of Milton officially opens Main Street Grade Separation. News Release. November 18, 2015.

[171] CP Submission. p. 33.

During consultations and in submissions received, many stakeholders suggested that Canada adopt a long-term strategy to reduce and close high-risk grade crossings in order to improve rail safety.[172] The Review was informed that Metrolinx[173] maintains a policy that does not allow the construction of any new level crossings on its rail corridors in the Greater Toronto and Hamilton Area. Rather, when a new crossing is deemed necessary, it should be built as a grade separation.[174]

However, some local and provincial governments noted that in some cases, grade crossings are necessary.[175] For example, the City of Montreal considered grade crossings to be a preferred option based on cost and the difficulties of integrating a grade separation into a dense urban environment. The City also pointed out other advantages, such as ease of use for mobility needs and effectiveness in reducing trespassing.[176] Others, such as the Ontario Ministry of Transportation and the Alberta Association of Municipal Districts and Counties, similarly agreed on the importance of grade crossings for remote and rural areas (e.g., Northern Ontario), natural resource sectors and for the quality of life of people in these regions.[177]

As indicated previously, grade crossing safety is a shared responsibility among many government and non-government stakeholders. This has prompted the suggestion that the provinces/territories and municipalities must assume greater responsibility in this area, similar to most US states. According to US legislation, each state must draw up a State Action Plan[178] dedicated to grade crossing safety that must discuss issue-areas related to the elimination of grade crossings (e.g., closure, relocation, consolidation, construction/renovation of grade separations) and new technologies, as well as measures in education, awareness-raising and communication.

Compliance with Grade Crossings Regulations

In general, stakeholders recognized the importance of the *Grade Crossings Regulations*, with regard to the upgrading and improvement of grade crossing safety. However, small municipalities, many in rural areas, expressed concern about the prohibitive costs of complying with the requirements of the Regulations by November 28, 2021.[179] They claimed that the RSIP was insufficient to help them upgrade their crossings, and that they needed substantial, stable and long-term financial support from governments, without which they would be forced to reduce funding for other services they deliver to their residents.

To illustrate this, the Saskatchewan Association of Rural Municipalities (SARM) stated that "[t]he *Grade Crossings Regulations* require road authorities to improve crossings to meet the standards by 2021. While the Rail Safety Improvement Program is helpful, additional funding and assistance must be dedicated to help road authorities improve crossings, in turn reducing injuries and fatalities caused by rail transportation."[180] SARM's view was shared by the Alberta Association of Municipal Districts and Counties, which added that "while the new *Grade Crossings Regulations* will increase safety at road-rail grade crossings, the costs of upgrading crossings may be prohibitive for some road authorities, particularly rural municipalities."[181]

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[172] CP Submission. p. 33; CN Submission. p. 62; RAC and CUTA Submission. p. 2; RAC Submission. p. 18; Government of Alberta Submission. p. 10

[173] Metrolinx is an agency of the Government of Ontario established in 2006 to improve the coordination and integration of all modes of transportation in the Greater Toronto and Hamilton Area.

[174] Metrolinx. RER (Regional Express Rail) Level Crossings Strategy. Memorandum to Metrolinx Board of Directors. February 17, 2017.

[175] City of Montreal Submission. p. 7; Ontario Ministry of Transportation Submission. p. 4; Alberta Association of Municipal Districts and Counties Submission. p. 3.

[176] City of Montreal Submission. p. 7.

[177] Ontario Ministry of Transportation Submission. p. 4; Alberta Association of Municipal Districts and Counties Submission. p. 3.

[178] Federal Highway Administration. US Department of Transportation. Highway-Railway Grade Crossing Action Plan and Project Prioritization Noteworthy Practices Guide. November 2016.

[179] Association of Manitoba Municipalities Submission. p. 1; Saskatchewan Association of Rural Municipalities Submission. p. 1; Alberta Association of Municipal Districts and Counties Submission. p. 2.

[180] Saskatchewan Association of Rural Municipalities Submission. p. 1.

[181] Alberta Association of Municipal Districts and Counties Submission. p. 2.

The railway industry called for federal support to upgrade railway crossings, and stressed that this support should prioritize grade crossings that represent the highest risks to rail safety.[182] CN defended this position by stressing that "...while CN supports the intention of the Regulations to achieve greater crossing safety in Canada, without a risk-based approach to implementing crossing upgrades, which would target investment at the highest risk crossings first, the current framework will likely not achieve the desired improvement to crossing safety."[183]

Short line and local railway companies that are required to improve grade crossings to meet the amended regulatory requirements noted that they face a unique set of challenges, separate from Class 1 railways, due to a disproportionate impact of the costs of compliance on their smaller operations. This issue is broader than grade crossings, and as such, is covered in Chapter 5.1.4.

Submissions to the Review also noted concern over the exchange of technical information between railway companies and road authorities, as mandated under the Regulations. For example, CN pointed out that it had not received information on approximately 24 per cent (i.e., 1,600) of the 7,000 public grade crossings on its Canadian rail network.[184] CN suggested that it would therefore be useful for Transport Canada to provide support to road authorities for the preparation of accurate and validated grade crossing information, to assist them in meeting the requirements under the *Grade Crossings Regulations* in a timely manner.

Grade Crossing Governance

The federal decision-making powers in relation to grade crossings are divided between the *Railway Safety Act* and the *Canada Transportation Act*. Some Review participants have argued that Transport Canada and the Canadian Transportation Agency (the Agency), which administer these respective Acts, work at cross-purposes.

The *Railway Safety Act* gives the Minister of Transport the power to approve or to set conditions on the construction of grade crossings, where these depart from engineering standards or are the subject of an objection (i.e., Section 10). It also gives the Minister the power to order the removal or modification of grade crossings that are not built according to the latest standards, or that jeopardize rail safety (i.e., Section 32). Moreover, Transport Canada has historically promoted the closure of grade crossings through the Grade Crossing Closure Program, and more recently through the Rail Safety Improvement Program.

The *Canada Transportation Act* gives the Agency the responsibility of settling disputes in relation to the construction and maintenance of crossings, and the apportionment of costs. In carrying out these responsibilities, the Agency has the power to authorize the construction of a suitable road or utility crossing if the land owner, road authority, and railway companies are unable to reach an agreement respecting its construction or maintenance. The Agency only intervenes when called upon to adjudicate or to register a given crossing.

For the railway industry, the current "dichotomy" of federal decision-making between the Agency and Transport Canada regarding the opening and closing of grade crossings is contradictory, inconsistent and could adversely affect public safety. Industry stakeholders believe that opening a new crossing should not be done in isolation, but considered within the context of all the other grade crossings in the vicinity and within an assessment of current and future use of the crossing. When the use exceeds a certain traffic threshold, it should be mandatory to install grade separations (e.g., bridges, walkways or tunnels). The RAC and the Class 1 railways suggested that Canada follow the lead of other countries, such as the United Kingdom and Italy, and adopt a policy that would prohibit the construction of new grade crossings unless there was evidence that there was no other possible solution, or that other grade crossings in the given area could be closed because of the construction of a new crossing.[185] CN suggested that, to send a strong signal about safety, the construction, maintenance and protection costs of a new grade crossing should be assumed by its proponent.[186]

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[182] Railway Association of Canada Submission. p. 18; CN Submission. p. 59; Railway Association of Canada and Canadian Urban Transit Association Submission. p. 3.

[183] CN Submission. p. 59.

[184] CN Submission. p. 57.

From the perspective of railway industry representatives, such as CN, CP and the RAC, inconsistencies in the current grade crossing governance regime should be adjusted so that safety is the first criterion to assess when considering the opening of a grade crossing. They suggested that Transport Canada should have the governing authority over the opening of grade crossings. Railway industry representatives added that the Agency would still have a role to play in apportioning the construction and maintenance costs of crossings, once they have been approved by Transport Canada based on safety considerations.

Although safety is not part of its mandate, the Agency takes it into account when making decisions regarding the approval of the construction of a new grade crossing. In accordance with the 2014 Memorandum of Understanding (MOU) between the Agency and Transport Canada,[187] the Department provides guidance and information on rail safety that the Agency uses to determine whether the construction of a contested grade crossing should be authorized and, if so, what type of crossing would be necessary.

The safety opinion developed by Transport Canada is of a technical nature, and focuses on the type of warning devices (e.g., crossing signs, lights, bells and gates), which would be legally required, and on whether or not a grade separation is recommended over a grade crossing. This is based on a number of factors, including what is known as the cross product[188]of road and rail traffic at a given crossing. Such an opinion has an impact on negotiations between parties in a case before the Agency, as safety considerations affect the estimated costs of building and maintaining a crossing.

Although the Agency and Transport Canada MOU appears to work well, it does not allow for a comprehensive, systematic review of the impact of a proposed grade crossing within a given region, nor is consideration of new crossings guided by any principles, such as reducing the number of grade crossings in order to enhance rail safety. For example, the MOU does not require the consideration of the proximity of another rail crossing before approving the building of a new crossing. The elimination of an existing grade crossing could also be formally considered before the opening of a new grade crossing.[189] In the same vein, estimating the anticipated use of a new crossing could be factored in prior to the approval of its construction.[190] As noted in a submission to the Review, "…the current regulatory framework perpetuates the entitlement to rail crossings, notwithstanding clear evidence that safety risks are increased as an outcome."[191]

Transparency and Technology

Stakeholders highlighted that investment in transparency and openness is critical to improving grade crossing safety. For example, many participants in the roundtable sessions called for a publicly accessible database that indicates the location and frequency of grade crossing accidents. This system could help identify high risk areas to prioritize for mitigation measures, to reduce the likelihood of accidents happening again. This idea would add value, given the fact that TSB investigations do not cover all railway accidents. A database that maps crossings could also be used to identify other problems, such as the frequency of suicides, or demographic groups at greater risk.[192] Of note, the grade crossing inventory[193] data provided by Transport Canada on its website does include some information on number of accidents, fatalities and train and vehicle volumes at a given crossing, but more can be done to make the information more complete and available in different formats (i.e., downloadable data as well as online interactive). Video surveillance at grade crossings and in high-risk areas was another solution raised that could help identify problem areas, to inform the development of targeted intervention strategies.

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[185] CP Submission. p. 33; CN Submission. pp. 62-63; Railway Association of Canada Submission. p. 18.

[186] CN Submission. pp. 62-63.

[187] Transport Canada. Memorandum of Understanding between Transport Canada and the Canadian Transportation Agency. December 10, 2014.

[188] The cross product with respect to a grade crossing, means the product of the average annual daily traffic of trains and engines on the line of railway and the average annual daily number of vehicles on the road that pass over the grade crossing.

[189] CP Submission. p. 33.

[190] CN Submission. p. 60.

[191] CN Submission. p. 62.

Some suggested that Canada take inspiration from the US Federal Railroad Administration (FRA). Its GradeDec model[194] and interactive maps[195] are tools that provide information to help the railway industry, road authorities, communities and others to identify the most effective rail crossing investment strategies (e.g., the closing of grade crossings, construction of grade separations) and other trends. In particular, the GradeDec model provides a comparative analysis of alternatives to grade crossings, designed to mitigate the risk of accidents and other inherent problems, such as delays and air quality.

Another suggestion was to take advantage of available mapping and detection technologies to improve the safety of grade crossings, similar to what is being done in the US and Italy. The US National Transportation Safety Board has asked technology companies operating in the US to include the locations of railway crossings in mapping applications, and to provide audible and visual alerts when drivers and pedestrians approach them.[196] Italy[197] and Japan[198] use detection technology to mitigate the risks of dangerous behaviours at grade crossings and along railway rights of way. Federal government leadership is required to encourage technology companies, such as Google Canada, to include information on grade crossings in their mapping applications in Canada, following the US example.

Among emerging technologies, there is potential to influence human behaviour at grade crossings and along railway tracks to help contribute to the reduction of grade crossing and trespassing accidents. An early example is vehicle connectivity technology, which could reduce car-train accidents through the deployment of "smart" vehicles that are able to identify, even before the driver, an approaching train at an upcoming grade crossing.

Considerations

Based on its consultations and research, the Review found that the rate of accidents related to grade crossings have not substantially decreased over the past number of years, and that such accidents remain a pressing public safety concern. There is no indication that this trend will improve unless additional action is taken to address the problem. Indicators, such as projected population growth, increasing urbanization, higher trade volumes resulting in more and longer trains, and a more active population crossing the tracks on bicycles or on foot all point to an increase in the number of grade crossing accidents. Current initiatives and investments focused on grade crossings are not sufficient to make a substantial difference in improving grade crossing safety and preventing this problem from getting worse.

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[192] Operation Lifesaver Canada Submission. pp. 9-10.

[193] Transport Canada. Grade Crossings Inventory. Website.

[194] Federal Railroad Administration. US Department of Transportation. GradeDec Crossing Evaluation Tool. Website.

[195] Federal Railroad Administration. US Department of Transportation. Maps - Geographic Information System. Website.

[196] National Transportation Safety Board. United States. Safety Recommendation H-16-015. December 19, 2016; and Safety Recommendation H-16-016. December 19, 2016.

[197] Vignozzi, Enrico. State of the art of the radar technology (76GHz) applied to detection of vehicles and pedestrians at level crossings. Presentation at the 9th International Level Crossings Awareness Day (ILCAD) Conference in Montreal, Quebec. June 2, 2017.

[198] Fujita, M. Safety Measures at Level Crossing of JR EAST. Presentation at the 27th International Railway Safety Council 2017 in Hong Kong. October 22-27, 2017.

Recommendation 6 – It is recommended that Transport Canada develop a comprehensive national initiative to improve grade crossing safety, in partnership with other levels of government, the railway industry and other key stakeholders. This initiative should aim to establish and prioritize crossing programming on a risk basis, taking into account safety, railway corridor efficiency and crossing use. It should build on existing efforts and include:

A. providing increased and ongoing funding for the Rail Safety Improvement Program;

B. formalizing and publishing criteria that specify when grade separations should be considered instead of grade crossings;

C. prioritizing grade separation projects and grade crossing closures in all major infrastructure programs, to enhance public safety and strengthen trade corridors;

D. pursuing technological solutions to reduce motor vehicle/pedestrian and train collisions; and

E. taking measures to limit the number of new grade crossings, notably by examining the legal framework that currently governs their construction.

4.2 Trespassing

Trespassing is defined as unlawful entry by the public on railway infrastructure, such as tracks, yards, bridges and in tunnels and is a violation of Section 26.1 of the *Railway Safety Act*.

Trespassing on railway property is a major public safety issue that is getting worse. It occurs in both rural and urban parts of the country through which rail lines pass. In particular, residential areas, schools or shopping centres near railway properties are places where people are often tempted to illegally use railway tracks as shortcuts, or corridors for taking walks.

There are several factors that contribute to trespassing-related accidents, including: substance use; advanced age; risk-taking behaviour among youth;[199] underestimating risks near railways; recreational activities; and theft or vandalism of railway property or equipment.[200] Further, while collisions resulting from trespassing are often unintentional, some trespassing incidents are committed by a person seeking to end their life. As a result, trespassing-related accidents involve "primarily pedestrians, not authorized to be on railway rights-of-way and who are struck by rolling stock other than at railway crossings."[201]

What has been done

Current initiatives to solve Canada's trespassing problem

A number of initiatives have been undertaken by rail safety stakeholders in Canada to address the issue of trespassing on railway properties. Transport Canada takes enforcement measures by issuing notices, orders and letters of concern related to identified safety gaps in trespassing monitoring. The Department also dedicates a portion of the funding available through the Rail Safety Improvement Program (RSIP) to public education and awareness projects.[202] This includes funding of $1.5 million over three years for Operation Lifesaver Canada to help it carry out rail safety awareness and education activities.

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[199] Mishara, Brian L. and Cécile Bardon. "Characteristics of railway suicides in Canada and comparison with accidental railway fatalities: Implications for prevention." *Safety Science Journal. Vol. 91*. January 2017. pp. 251–259.

[200] Topel, Kurt. "*Rail Trespassing and Suicide Prevention*." Presentation at the 9th International Level Crossings Awareness Day (ILCAD) Conference in Montreal, Quebec. June 2, 2017.

[201] Transportation Safety Board of Canada. Statistical Summary – Railway Occurrences 2016. Footnote 5.

Operation Lifesaver Canada is an organization dedicated to reducing the risks associated with rail crossings and trespassing on railway properties. This not-for-profit organization was launched Canada-wide in 1981 with the support of the RAC and Transport Canada. Nearly all of its staff are volunteers, mostly railway employees and retirees. This volunteer network visits schools, shopping centres and community groups to make the public aware of the dangers of trespassing on railway property and crossings.

In 2017, Operation Lifesaver Canada launched a virtual reality campaign, "Look. Listen. Live." to demonstrate the dangers of unsafe situations near railway tracks and trains, and how to avoid them.[203] The campaign targets young adults, in particular males between the ages of 18 and 25, who, in addition to being familiar with virtual reality, "are the most likely to walk across active train tracks and to drive around lowered gates; often being seriously injured or killed by trains as a result."[204]

Class 1 railway companies (i.e., CN, CP, VIA Rail) have their own police forces. Their role is to protect property owned or administered by the railways. Combatting trespassing on railway property is part of their responsibility, which they help to achieve in part through community outreach on the dangers of trespassing. Railway police constables are appointed pursuant to Section 44 of the *Railway Safety Act* and have the same powers as federal, provincial or municipal police officers. They have jurisdiction within 500 metres of railway property, and can make arrests, issue tickets, conduct investigations and carry out other duties normally associated with the police.

International Approaches

The Community Trespass Prevention Program[205] is an initiative implemented by the US Federal Railroad Administration (FRA) to reduce the number of trespassing-related injuries and fatalities across the United States. This program is based on the Community, Analysis, Research and Evaluation (CARE) problem-solving model that is intended to provide a step-by-step approach to solving trespassing problems in communities. The FRA initiative is similar to Transport Canada's former Direction 2006 program[206] activities to educate the public about rail safety, including the hazards of trespassing.

The John A. Volpe National Transportation Systems Center[207] and the FRA acknowledge that they have based their activities on Transport Canada's past suicide prevention community approach, in order to conduct research in the US and draw up and assess trespassing prevention strategies.[208] The results of this research will serve to develop national guidelines and recommendations for reducing the number of trespassing-related incidents and fatalities across the US.

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[202] Transport Canada. Rail Safety Improvement Program. Website.

[203] Operation Lifesaver Canada. Look. Listen. Live. Website.

[204] Careless, James. "Look. Listen. Live." Interchange. Railway Association of Canada Publication. Fall 2017. p. 40.

[205] Office of Railroad Safety. Federal Railroad Administration. US Department of Transportation. Community Trespassing Prevention Guide. December 2011.

[206] Direction 2006 was a public education program for rail safety in Canada. It was intended to halve the grade crossing and railway trespassing accident rate from 1996 to 2006. Partners included all levels of government, railway companies and their unions, public safety organizations, police and community groups.

[207] The mission of the John A. Volpe National Transportation Systems Center (Volpe Center), established by the US Department of Transportation, is to anticipate and address new challenges and develop solutions that advance the US and global transportation systems.

[208] Federal Railroad Administration. US Department of Transportation. Trespass Prevention Research Study – West Palm Beach, FL. July 16, 2014.

Since 2012, the FRA has been holding regular workshops on preventing trespassing on railway property.[209] This enables the FRA to develop a solid base of knowledge in the area of rail transportation-related trespassing and suicide intervention and prevention.

The FRA, in collaboration with other rail safety stakeholders (e.g., representatives of the federal government, state governments, local governments, railway companies, transportation agencies, universities, communities and international partners), also set up a rail safety research program, which includes the following six research areas that the FRA may use to develop evidence-based trespassing and suicide intervention and prevention strategies:[210]

a. pedestrian safety issues;

b. hazard management;

c. design, technology and infrastructure;

d. community outreach;

e. enforcement; and

f. intentional deaths/acts.

In Europe, the RESTRAIL project (REduction of Suicides and Trespasses on RAILway property) is another initiative to be highlighted, because it has resulted in effective measures to prevent and mitigate rail-related trespassing and suicide risks. It has also made it possible to gather and analyze the existing data of initiatives implemented in various countries and assess the effectiveness of some of these measures.[211]

What we have heard

Stakeholders recognized that trespassing on railway property is a serious public safety issue that requires concrete and coordinated action. Manitoba Infrastructure indicated that "…trespassing will likely remain an endemic issue for some time."[212] CP stated that the number of fatalities and injuries due to trespassing each year in Canada is unacceptable and unfortunately continues to increase, despite considerable ongoing efforts by railway companies to work with communities to prevent these intrusions.[213] In turn, CN asserted that one of the causes of the increase in trespassing incidents is poor neighbourhood planning that does not give serious consideration to the location and capacity of existing grade and elevated crossings.[214]

Unfortunately, current initiatives and investments do not seem to be making a significant difference in trespassing-related rail accident trends. In general, there was a consensus among rail safety stakeholders about the need for the three levels of government to work together to provide substantial, stable and long-term financial support for public awareness and education programs through organizations such as Operation Lifesaver Canada, or other organizations that can help reduce trespassing. A joint submission by the Railway Association of Canada and the Canadian Urban Transit Association suggested that not only do trespassing prevention initiatives and related education programs contribute to saving lives and preventing injuries, these measures also support more reliable trade gateways.[215]

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[209] Federal Railroad Administration. US Department of Transportation. 2012 Right-of-Way Fatality and Trespass Prevention Workshop. April 1, 2013.

[210] Federal Railroad Administration. US Department of Transportation. 2012 Right-of-Way Fatality and Trespass Prevention Workshop. April 1, 2013. pp. 20-47.

[211] EU RESTRAIL Project Consortium. Project Coordinator: International Union of Railways (UIC). REduction of Suicides and Trespasses on RAILway property. Website.

[212] Manitoba Infrastructure Submission. p. 6.

[213] CP Submission. p. 34.

[214] CN Submission. p. 42.

[215] Railway Association of Canada and Canadian Urban Transit Association Submission. p. 2.

According to some roundtable session participants, rail safety education and awareness-raising can have the greatest impact on reducing trespassing when it is part of curricula and school activities intended for children. Further, an education-based prevention strategy works best when paired with communication and enforcement or the installation of fences and signage. The introduction of the annual Rail Safety Week as an education and public awareness activity was viewed positively.

While, as noted previously, most trespassing accidents are unintentional, some trespassing-related deaths were attributable to suicide, especially along rail lines located near psychiatric facilities.[216] Through its consultations and research, the Review identified insufficient support for suicide prevention strategies in Canada's rail safety regime.

Despite the extent of the problem, statistics currently available in Canada do not make it possible to accurately identify how many trespassing accidents are suicides. This is because Canada does not distinguish between intentional and unintentional trespassing accidents in its official data. Other parts of the world, such as Europe, distinguish between the two so they can develop prevention strategies and targeted responses to suicide and trespassing on railways. In spite of the lack of official data on railway suicides, a Université du Québec à Montréal study funded by Transport Canada found that about 37.9 per cent of railway fatalities between 1999 and 2008 were suicides. According to this study, suicides involving passenger and commuter trains account for the highest proportion of railway suicides, at 45.6 per cent and 53.6 per cent, respectively.[217]

Some roundtable session participants suggested that more data should be collected on demographic factors with respect to people involved in grade crossing and trespassing accidents, including the identification of accidents suspected to be suicides.[218] This is essential information not only for determining target groups in awareness campaigns, but also for taking their characteristics into account in the development of trespassing and suicide prevention strategies. The Transportation Safety Board of Canada does not currently provide this demographic information. Operation Lifesaver Canada asserted that access to evidence of railway suicides would enable it to be much more strategic in designing targeted prevention measures.[219]

One of the prevention strategies recommended in the research for trespassing and suicide is to use fences and physical barriers to restrict access to railway tracks, particularly where there are suicide "hotspots," high-density population areas and locations near psychiatric facilities.[220] For example, the installation of fences around bridges is considered an effective suicide prevention measure in some countries, such as New Zealand and Switzerland, because it has helped reduce the number of suicides considerably.[221]

In the Canadian context, installing fences along rail lines does not appear to be an appropriate strategy for preventing suicide by trespassing. Unlike European countries, which have high-density populations and a high density of rail lines, Canada has a population scattered across a vast landmass, making it difficult and costly to fence the entire network. Nevertheless, this solution could be more appropriate in urban areas with highly concentrated populations around railway tracks.[222]

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[216] Mishara, B.L. and Bardon, Cécile. *"Systematic review of research on railway and urban transit system suicides." Journal of Affective Disorders 193.* 2016. pp. 215-226; Havârneanu, Grigore M, Jean-Marie Burkhardt and Françoise Paran. "A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents". *Accident Analysis and Prevention 81*. 2015. pp. 30–50.

[217] Mishara, B. L. and Cécile Bardon. "Characteristics of railway suicides in Canada and comparison with accidental railway fatalities: Implications for prevention". *Safety Science 91*. 2017. pp. 251-259.

[218] Operation Lifesaver Canada Submission. pp. 9–10.

[219] Operation Lifesaver Canada Submission. p. 10.

[220] Havârneanu. "A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents"; Mishara. "Systematic review of research on railway and urban transit system suicides".

[221] Havârneanu, Grigore M., Jean-Marie Burkhardt and Françoise Paran. "A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents". *Accident Analysis and Prevention 81*. 2015. pp. 30–50..

[222] Mishara, B. L. and Cécile Bardon."Characteristics of railway suicides in Canada and comparison with accidental railway fatalities: Implications for prevention". *Safety Science 91*. 2017. pp. 251-259.

Other suicide prevention strategies have also been suggested, such as collaboration with the press to prevent media coverage of railway suicides, particularly in high-risk areas, so as to prevent any attempts by others to similarly access these same sites.[223] Roundtable session participants also proposed providing training for mental health professionals working in psychiatric facilities located close to rail lines.[224]

During the consultations, the Review learned of some Canadian railway suicide prevention initiatives. For example, along its rail network in Toronto, Metrolinx put up signs indicating a mental health helpline number for persons in distress.[225] These measures are part of the Metrolinx strategy for Regional Express Rail level crossings.[226] One of this strategy's objectives is to raise awareness and educate the public about the dangers of trespassing on railway tracks and the importance of obeying the rules in that regard.

In addition to rail specific initiatives, there are also initiatives at the federal level, including crisis centres set up across Canada.[227] In the majority of cases, they provide 24-hour services and are staffed by professional mental health counsellors. Also noteworthy is the Federal Framework for Suicide Prevention,[228] which, pursuant to the *Act Respecting a Federal Framework for Suicide Prevention* (2012), is intended to serve as a guide for federal government efforts to promote mental health and well-being, increase awareness and promote suicide prevention across the country through partnerships, collaboration, research and sharing of best practices.

The Review also learned that there are emerging technologies that could be used to put forward innovative solutions to prevent and take action against trespassing and railway collisions involving trains and people. For instance, drones have considerable trespassing prevention potential. They can identify and alert railway operators to the presence of trespassers on rail lines at any time of day, from a distance of up to 5 kilometres (i.e., 3 miles).[229]

Collaboration between the three levels of government, railway companies, communities and individuals is an important part of the social interventions that were found to be effective in some trespassing and suicide prevention studies.[230] Inter-organizational collaboration would generate a synergy effect, because the underlying purpose would be to share resources and coordinate activities in order to achieve the greatest possible reduction of trespassing and suicides. This type of collaboration would also help prevent the duplication of trespassing and suicide prevention efforts.

CP emphasized that trespassing reduction initiatives must be based on collaboration and include the participation of governments, railway companies, communities and the public. This is especially true given that communities are expanding and coming into closer proximity to railway operations. It is undoubtedly important for key rail safety stakeholders and community groups to engage with each other to promote rail safety by implementing awareness and education strategies designed to protect the public from the risks of loss of life and serious injury that may result from trespassing and suicides on railway property.

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[223] Havârneanu. "Safety measures to prevent railway suicides and trespassing accidents"; Mishara, B.L. and Cécile Bardon. "Systematic review of research on railway and urban transit system suicides." *Journal of Affective Disorders 193*. 2016. pp. 215–226.

[224] Mishara. "Characteristics of railway suicides in Canada"; Mishara. "Systematic review of research on railway and urban transit system suicides".

[225] Operation Lifesaver Canada Submission. p. 11.

[226] Metrolinx. RER (Regional Express Rail) Level Crossings Strategy. Memorandum to Metrolinx Board of Directors. February 17, 2017.

[227] Canadian Association for Suicide Prevention. Thinking About Suicide?. Website.

[228] Public Health Agency of Canada. Working Together to Prevent Suicide in Canada: Federal Framework for Suicide Prevention. November 24, 2016.

[229] Gent, Rich. Use of Unmanned Aerial Vehicles in Trespass Abatement. Presentation at the Right-of-Way 2015 Trespassing Workshop. Charlotte, North Carolina. August 2-6, 2015. p. 6.

[230] Havârneanu, Grigore M., Jean-Marie Burkhardt and Françoise Paran. "A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents". *Accident Analysis and Prevention 81*. 2015. pp. 30–50.

Considerations

The next few decades are expected to bring continued population growth, urbanization, construction of new developments in proximity to rail lines, and increased transportation of goods by rail. These factors will raise the likelihood of fatalities and serious injury due to rail transportation-related trespassing and suicides.

The Review's work has clearly shown that no single stakeholder has all of the necessary tools and powers to make substantial and lasting improvements to the problem of trespassing and suicide on railway property. As with the grade crossing issue, the Review believes that Transport Canada needs to take on a leadership role to strategically align the efforts of all stakeholders (at the industry, and government and non-government actors at the federal, provincial/territorial and municipal levels), with a view to making trespassing socially unacceptable due to its high risk, and to address the underlying social issues that can lead people to illegally access railway property.

In addition, trespassing and suicide prevention should be included in the issues to be discussed in ministerial-level meetings under Recommendation 9, as this is a pressing public safety concern that impacts all regions. Transport Canada and railway industry efforts to implement rail transportation-related suicide prevention strategies will also need to be aligned with broader federal government efforts to promote the mental health and well-being of Canadians, particularly the work being done through the Federal Framework for Suicide Prevention.

The Review believes that Transport Canada would be able to successfully carry out this mission, given its role as leader, partner, funder, information provider and rail safety regulatory agency.

Recommendation 7 – As human behaviour remains a persistent causal factor in rail-related deaths and serious injuries due to trespassing and grade crossings accidents, it is recommended that the federal government, in collaboration with other levels of government, the railway industry, academia and communities develop a national strategy to reduce the number of fatalities and injuries that result from trespassing on railway property. This strategy should comprise a number of components, including:

- **A. a trespassing prevention program to create safer communities by promoting the development of long-term trespassing prevention measures through community-based partnerships. This includes sufficient and sustainable support for education and awareness programs, such as Operation Lifesaver Canada, to help them continue their activities in promoting rail safety among target groups;**
- **B. funding for research projects at universities and research centres to tackle trespassing and suicide issues; and**
- **C. linking to other initiatives, such as the Federal Framework for Suicide Prevention to work with other stakeholders to develop railway suicide prevention/intervention strategies that are evidence-based and supported by research.**

4.3 Land Use Planning

Throughout its work, one of the key issues that has been brought to the attention of the Review is that of the ever closer proximity of land developments and incompatible land use around railways. This issue was brought up, for different reasons, by railways, community groups, and municipalities alike. Moreover, the issues surrounding incompatible land use and proximity have been amplified since the tragic and unfortunate events at Lac-Mégantic. Given the current and anticipated future growth in rail traffic, coupled with pressure on municipalities to maximize the use of available land for an increasingly urban population, the Review strongly believes that this persistent issue deserves significant attention by all levels of government and railways.

Residential, commercial, industrial and institutional developments generate property tax revenues that municipalities need to fund the services they provide in their communities. The need for these revenues is one of the factors that foster the proliferation of incompatible developments with rail operations. Another factor that prompts residential developments near train stations is the need for public transit and sustainable mobility.

Increasing rail traffic, particularly the transportation of dangerous goods, further exacerbates the proximity issue. Despite these challenges, consideration for rail safety is not consistently factored into land use planning decisions across Canada.

The issues posed by developments near rail operations perfectly illustrate the degree to which rail safety is a shared responsibility that involves many stakeholders, such as developers, residents, railway companies, communities and governments. This is a challenge for all levels of government, as land use planning falls under provincial/territorial, Indigenous and municipal jurisdictions, whereas Canada's main railways and their rights-of-way are regulated by the federal government.

BEDFORD, NS - A NEW CONDO WITHOUT MITIGATION (CN, 2015)

What has been done

In Canada, there are no consistent protocols for consultation or instruments for appeal in the area of land use. In addition, provincial/territorial and municipal procedures for land zoning and permit-issuing vary widely across the country. Under Subsection 8(1) of the *Railway Safety Act*, a railway company must give notice of a proposed railway work to adjacent landowners and the municipality. However, municipalities and developers are not required to give the same type of notice to railway companies when they are planning to build a new complex near rail lines. Under such circumstances, the railway companies are often presented with a fait accompli, because they have little recourse in sharing their concerns before a given project is approved. Thus, it is too late to take action to amend municipal land use plans or developments, even if there is a safety issue.

The issue of proximity between rail operations and residential developments has been studied and has been the object of initiatives by rail safety stakeholders. The 2007 RSA Review recognized the scope of the issue of proximity between railways and communities. It recommended that: "[t]he *Railway Safety Act* should be amended to require the developer and municipalities to engage in a process of consultation with railway companies prior to any decision respecting land use that may affect railway safety" (i.e., Recommendation 34).[231] This recommendation did not lead to any subsequent amendments to the Act.

The 2015 *Canada Transportation Act* Review (CTA Review) briefly examined the matter of rail safety and the issues of proximity between rail operations and communities. To reduce the risks associated with interactions between the public and rail transport, the CTA Review recommended that "the federal government use infrastructure funding leverage to:

a. support the relocation of rail infrastructure outside of dense urban centres, and the implementation of technologies or infrastructure aimed at improving the safety of the rail/urban interface, with safer alternatives including road/rail grade separations, tunnels, and robust noise/visual barriers;

b. encourage municipal governments to establish a buffer zone around new rail developments in order to provide separation from residential development and mitigate future concerns over rail and logistics operations."[232]

Since 2003, the Federation of Canadian Municipalities (FCM) and the Railway Association of Canada (RAC) have been working together as part of their Proximity Initiative in order to find a balance between the interests of railway companies and the communities through which their rail lines cross. In 2013, collaboration between the FCM and the RAC led to the "Guidelines for New Development in Proximity to Rail Operations" (the Proximity Guidelines).[233] The main objectives of the Proximity Guidelines are to help municipalities and railway companies set key policies for land use planning near rail infrastructure, and establish a process to prevent development that is incompatible with rail operations.

A Memorandum of Understanding (MOU) exists between the Canadian Transportation Agency (the Agency) and Transport Canada that aims to establish their respective responsibilities related to, among other aspects, complaints on noise and vibration from trains.[234] The Proximity Guidelines are part of the dispute settlement process under the "Guidelines for the Resolution of Complaints Concerning Railway Noise and Vibration" established by the Agency.[235]

Despite recent progress, not all provincial/territorial and municipal governments have formally incorporated the Proximity Guidelines into their respective legislative frameworks, regulations or bylaws governing land development (including land near rail infrastructure). The Province of Ontario has been a leader in proactively encouraging land use compatibility with rail operations in order to protect communities, while also protecting the integrity and capacity of its transportation system. To this end, it has enacted legislation and developed guidelines that include many aspects of the Proximity Guidelines.

Regulations under the Ontario *Planning Act* require that railway companies be informed of official plans, and any amendments, subdivision plans, zoning bylaws and agreements to split lands, if a proposal involves any land within 300 metres of a rail line. This allows railway companies to review the proposed developments and recommend provisions to mitigate potential issues with compatibility in land use or safety. If the adjustments proposed by the railway company to resolve these matters are not incorporated into the proposal, the matter can be brought to the Ontario Municipal Board.

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[231] 2007 *Railway Safety Act* Review. p. 107.

[232] 2015 ***Canada Transportation Act*** **Review.** *Pathways: Connecting Canada's Transportation System to the World-Volume 1.* **December 2015. p. 143.**

[233] **Federation of Canadian Municipalities / Railway Association of Canada.** Guidelines for New Development in Proximity to Rail Operations. **May 2013.**

[234] **Canadian Transportation Agency / Transport Canada.** *Memorandum of Understanding between the Canadian Transportation Agency and Transport Canada.* **December 10, 2014.**

[235] **Canadian Transportation Agency.** Guidelines for the Resolution of Complaints Concerning Railway Noise and Vibration. **October 20, 2008.**

Under the authority of its *Planning Act,* Ontario has also developed a *Provincial Policy Statement (PPS)* that became effective on April 30, 2014. The PPS provides municipalities with a policy direction on matters related to land use planning that are of provincial interest, and establishes the policy foundation for regulations governing the development and use of land.[236] All municipal official plans and decisions affecting land use planning matters must comply with the PPS.

Additionally, land use considerations have been integrated into Ontario's Freight Supportive Guidelines. These are intended to complement the existing provincial policy framework by providing strategies, information and knowledge to assist municipalities in implementing freight supportive policies in their official plans. Although it is not mandatory, the Province's freight strategy is meant "to assist in the creation of communities, individual developments and transportation networks that are capable of supporting freight industries while integrating and balancing the compatibility of surrounding land uses and the needs of other transportation system users."[237]

Saskatchewan and New Brunswick have also included requirements in their planning and land use legislation that reflect the Proximity Guidelines and are intended to mitigate problems resulting from proximity between rail operations and developments. The Government of Saskatchewan developed *The Statements of Provincial Interest Regulations*[238] under the *Planning and Development Act, 2007*, in order to harmonize provincial and municipal objectives in the area of land use planning. These regulations require that municipalities ensure that land use is compatible with existing or planned transportation infrastructure, including rail infrastructure.

With respect to New Brunswick, the *Community Planning Act,* which came into force on January 1, 2018, includes a notification process similar to that established by Ontario. In fact, this Act requires a railway company to be notified by a development officer, of a tentative plan submitted for approval under a subdivision bylaw when this includes, in the opinion of the development officer, a utility or other easement, and that the land is located within 300 metres of a rail line operated by the railway company.[239] It should also be noted that the Government of Quebec has developed voluntary directions on land use planning near rail lines/operations by encouraging land use by municipalities that aligns with the Proximity Guidelines.

At the municipal level, the RAC estimates that about 60 municipalities have adopted all or parts of the Proximity Guidelines.[240] Montreal is the first major urban centre to have made them part of its land use planning and development plan in January 2015.[241] About 10 other large cities, including Toronto, are in the process of examining the Proximity Guidelines and more than 175 municipalities have adopted or are using this tool in their decisions on land use planning.[242]

What we have heard

Comments received through the roundtable sessions held across Canada and the submissions provided to the Review underlined the work of the FCM and the RAC in land use planning and development, particularly the development of the Proximity Guidelines. This tool has helped initiate discussion and greater information exchange between communities and railway companies for the purpose of compatible cohabitation between the public and rail operations.

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[236] Ontario Ministry of Municipal Affairs and Housing. *2014 Provincial Policy Statement*. April 30, 2014.

[237] Ontario Ministry of Transportation. Freight-Supportive Guidelines. 2016. p. 3.

[238] Government of Saskatchewan. *The Statements of Provincial Interest Regulations being Chapter P-13.2 Reg 3.* March 29, 2012.

[239] Government of New Brunswick. *Community Planning Act*. January 1, 2018. Section 77 (1) (h) (v).

[240] Railway Association of Canada Submission. p. 19.

[241] City of Montreal. *Schéma d'aménagement et de développement de l'agglomération de Montréal,* Chapitre 4 – Le document complémentaire, 4.8.3. April 1, 2015. (French only.)

[242] Federation of Canadian Municipalities / Railway Association of Canada Submission. p. 8.

Concerns were raised regarding the limitations of the Proximity Guidelines. For example, the Review heard that the Proximity Guidelines do not fully address the issue of existing buildings, nor measures to be taken by communities already established near rail operations. Additionally, certain stakeholders suggested that the Proximity Guidelines should include the assessment of risks associated with transportation of dangerous goods and the mitigation measures in the event of a release of dangerous goods.[243] The Review also heard that the Proximity Guidelines should reflect regional realities, as some of the prescribed mitigation measures are considered to be costly and not fully adapted to rural areas, where the volume of rail traffic is low in comparison with urban areas.

It is also important to mention that rail safety cannot be isolated from the problem of noise and vibrations from rail operations. The noise and vibration issues from trains also impact the quality of life of the people living or working near rail operations.[244] According to the group "Nous et les trains",[245] noise and vibrations may be an indicator of the location where potential train derailments may cause the most damage. This group indicated that the federal government should intervene to identify strict noise limits for rail operations. Of note, the Proximity Guidelines also include mitigation measures that would minimize noise and vibration issues near rail infrastructure.

The Review also heard concerns regarding the adoption of the Proximity Guidelines and the role that the federal government might play in their formal adoption and promotion with provinces/territories and municipalities. However, there were considerable differences of opinion among stakeholders on how best to ensure the Proximity Guidelines were implemented.

Some stakeholders were opposed to incorporating the Proximity Guidelines into federal regulations, noting that land use planning is under provincial/territorial jurisdiction, and must be legislated at that level. This is the approach that the Government of Saskatchewan is taking. The Province intends to strengthen its regulatory framework on land use planning by making the Proximity Guidelines part of *The Statement of Provincial Interest Regulations.*[246] The FCM, which was of the same view, asserted that "the federal government should continue to work collaboratively with provincial and municipal governments to advance land use planning practices in proximity to rail operations, rather than mandating a one-size-fits-all approach not suitable for a country as diverse as Canada."[247]

Others believed the federal government holds the responsibility and would have to intervene to ensure constant and consistent implementation of the Proximity Guidelines across Canada. In this sense, the RAC recommended that "[t]he Minister of Transport directs provincial transportation ministers to adopt the RAC/FCM Proximity Guidelines in full. Included in this requirement should be a mandatory setback for new development within proximity of rail operations of 30 metres."[248]

Railway industry representatives suggested that the federal government base its policies on the approach it had adopted to intervene in land use planning near airports, which is regulated at the federal level,[249] to ensure that future development near an airport stays compatible with the safe operation of aircraft and of the airport itself.[250] The legislative foundation for these regulations is set out in Subsection 5.4 of the *Aeronautics Act.*

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[243] Rail Safety First Submission. p. 9; City of Montreal Submission. p. 8.

[244] Federation of Canadian Municipalities / Railway Association of Canada Submission. p. 4.

[245] Nous et les trains Submission. p. 2.

[246] Government of Saskatchewan Submission. p. 10.

[247] Federation of Canadian Municipalities Submission. p. 4.

[248] Railway Association of Canada Submission. p. 27.

[249] CP Submission. p. 34; CN. Submission. p. 54; CPSC. *Land Use Planning, Rail Proximity and Public Safety.* Report developed for the Railway Association of Canada and provided as Annex F of the Railway Association of Canada Submission.

[250] Transport Canada. Airport zoning regulations. Website.

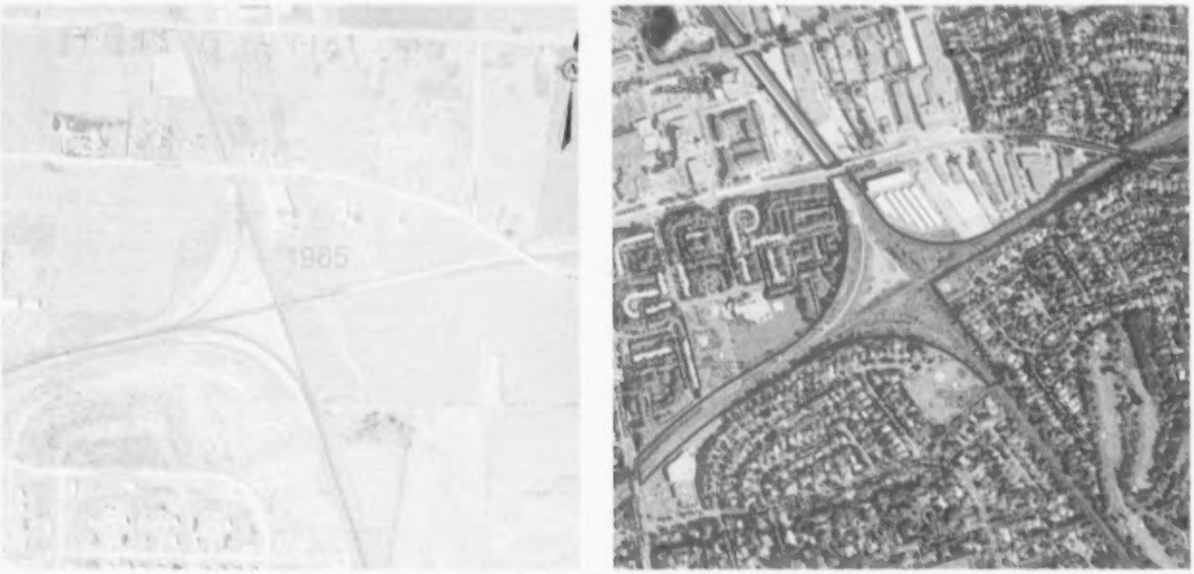
In addition to the regulations on airport zoning, the federal government regulates mining activities on lands adjacent to rail operations through the *Mining Near Lines of Railway Regulations*, developed under Part III (Non-Railway Operations Affecting Rail Safety) of the *Railway Safety Act*. These regulations prohibit the construction, alteration or operation of non-rail infrastructure that compromise rail safety without a notice of at least 60 days to the railway company that owns the rail line.

Although the federal government has played a role in regulating land use planning for the purpose of protecting the safety of the public in areas such as airports, the Review heard that jurisdictional considerations were a contributing factor in the federal government's decision not to legislatively intervene on the matter of land use near rail operations, as was recommended by the 2007 RSA Review.

It should be noted that a legal opinion[251] was submitted to the Review by the RAC regarding the federal government's powers to adopt safety measures to ensure a safe use of land near rail operations. This opinion argues that because federally-regulated companies are required to mitigate the risks of accidents causing potential harm to persons or property in the normal course of their rail operations, the federal government has authority under section 92(10)(a) of the *Constitution Act, 1867* to intervene in the area of land use planning and development near rail infrastructure. While the legal opinion does not suggest that the federal government has a blanket authority to impose any measure it wishes, it is the Review's opinion that it supports amendments to the *Railway Safety Act* to require pre-notification to affected railway companies prior to land use authorizations within 300 metres of a rail corridor, as well as the establishment of safety standards for land use within 30 metres of rail operations.

Considerations

Despite the widespread recognition by a range of stakeholders that proximity issues were a significant safety issue, there was little consensus on what provinces/territories, municipalities or the federal government should do to tackle this problem. Due to these differences and the multiple jurisdictions involved, the Review concluded that there is a critical need for the federal government to play a significant leadership and convener role to address these proximity and land use issues.



DONCASTER DIAMOND, IN SOUTHERN ONTARIO, IN 1965 (LEFT), IN 2009 (RIGHT). (PHOTOS FROM CN)

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[251] McCarthy Tétrault, Canadian Federal Proximity Jurisdiction, Legal Opinion provided to the Railway Association of Canada and included as part of its Submission, November 2017.

It is time to take action to find a solution to the longstanding issue of incompatible use of land near railways, given that population growth, continued urbanization and densification guarantee that the proximity between rail operations and communities will become a more and more pressing public safety issue.

The photographs included show how a rural railway junction in 1965 has become a surrounded, highly populated urban area in 2009, clearly illustrating the exponential growth and expansion of Canadian cities.

Obviously, there is need for a more comprehensive approach across Canada that appropriately considers and creates a land use policy for developments in proximity to railway operations that includes setbacks and mitigation measures to address land use compatibility and minimize potential public safety risks, before shovels hit the ground.

Federal leadership is needed to ensure an effective and consistent approach in dealing with developments in proximity to rail operations throughout the country.

It cannot be stressed enough that communication among all stakeholders and interested parties should be the backbone for this approach. No one jurisdiction or organization holds all the levers and tools to ensure that land development around Canada's rail transportation corridors and yards is constructed in a manner that best safeguards Canadians and their communities. While the federal government already has the authority to regulate land use adjacent to rail operations, the Review believes that it would be useful to have this authority extended in the Act, with explicit regulation-making powers to address the compatible and safe use of land in proximity to railways.

Recommendation 8 – It is recommended that the federal government provide leadership in addressing incompatible land use around rail operations by driving a substantive dialogue between all jurisdictions and stakeholders, with a view to developing a solution to land use near rail operations on a national scale. Measures to this effect should include:

A. launching a senior government-level dialogue with the provincial/territorial governments to promote the formal adoption of measures equivalent to the "Guidelines for New Development in Proximity to Railway Operations," developed jointly by the Federation of Canadian Municipalities and the Railway Association of Canada, in land use planning policies that apply to municipalities;

B. amendments to Part III (Non-Railway Operations Affecting Railway Safety) of the Railway Safety Act be made to provide the Governor in Council with the authority to make regulations requiring land use planning authorities to provide pre-notice to affected railway companies before authorizing land use or zoning changes, as well as construction within a prescribed distance (e.g., 300 metres) of a railway corridor; and

C. amendments to Part III (Non-Railway Operations Affecting Railway Safety) of the Railway Safety Act to to provide the Governor in Council with the authority to make regulations that define safety criteria for construction and activity within a prescribed distance (e.g., 30 metres) of a railway operation. Regulations should be developed in consultation with relevant provinces/ territories, Indigenous groups, municipalities, railways, associations, and citizen groups.

5) Governance, Collaboration and Public Trust

One of the major challenges in strengthening Canada's rail safety regime is that there are many players with different roles and priorities that affect rail safety. Rail safety is a shared responsibility that involves: a central role for railway companies; a vital regulatory/oversight and leadership role for the federal government; considerable responsibilities of provinces/territories and municipalities; community and other non-governmental organizations; shippers; as well as individuals who live and work near rail operations. This makes it difficult to tackle issues that require significant collaboration and cooperation. This was well illustrated in the previous section regarding proximity issues.

Even though the railway system is highly integrated and interdependent, both nationally and cross-border with the US, the overall governance of the railway system is faced with many coordination and governance issues that result in uncertainties over authorities and safety objectives. These issues manifest themselves with particular amplitude in the interface between the federal and provincial governments on rail safety matters, in the regulatory oversight of short lines and local railway companies and in the development of Rules.

Finally, one major challenge for collaboration and public trust is the requirement for a significant increase in the trust and communication between communities and Transport Canada as well as railway companies regarding the rail safety regime. To achieve this, there is a need for a significant improvement in the information platform and outreach relating to communities.

5.1 Governance: Federal-Provincial-Territorial Interface and Short Line and Local Railways

Issue: The Canadian railway network is integrated, but the legislative and regulatory frameworks that govern its safe operations are not fully harmonized between jurisdictions. This creates unnecessary duplication and leads to uncertain accountability between jurisdictions

Challenge: Renewing and sustaining Transport Canada's engagement efforts aimed at multiple jurisdictions, with a view to simplifying requirements and focusing resources where they are needed to maintain and improve safety

To ensure that Canada's overall rail safety regime functions safely and effectively, all of the regime's inter-related and inter-dependent components must be compatible and work well together. This requires strong relationships and a spirit of collaboration between the federal government and provincial/territorial governments, and the roles and responsibilities of each side must not only be clear, but also acted upon for the overall regime to perform as desired.

In Canada, rail safety is the shared responsibility of many parties, including the federal and provincial/territorial governments. Railways fall under federal jurisdiction when their operations cross international or provincial boundaries, and under provincial jurisdiction when their operations are limited strictly to one province, on provincially-regulated track.

Provincial/territorial rail safety legislation varies across the country, from incorporating the entire *Railway Safety Act* and its associated rules and regulations by reference into provincial legislation, to developing stand-alone legislation with elements similar to those of the federal regime. The administration of provincial rail safety legislation also varies from province to province in terms of enforcement powers, planning and frequency of inspections.

The differences in the varying rail safety regimes between the provinces/territories and the federal government are causing issues that must be addressed to keep rail transportation in Canada safe and efficient.

5.1.1 Federal-Provincial-Territorial Interface

Under the federal rail safety regime, it is Transport Canada's responsibility to oversee railway companies operating within the legislative authority of Parliament on behalf of the Minister of Transport. In contrast, provinces/territories with railways under their jurisdiction are directly responsible for carrying out their own rail safety oversight. Nonetheless, the capacity of provinces/territories to provide rail safety oversight, including inspections, varies and many provinces have signed Memoranda of Agreement (MOAs) with the Government of Canada to have Transport Canada conduct inspections of provincially-regulated railways on their behalf. These inspections are done on a cost-recovery basis, with the fees set out in each MOA.

Currently, seven MOAs remain in effect, covering six provinces and more than 18 railways (including a MOA that is specific to Metrolinx, an urban transit authority in Ontario). The majority of MOAs were signed in the 1990s following an increase in the number of short line railways under provincial jurisdiction resulting from the sale or lease of track by major carriers. To date only minor updates have been made to the original MOAs.

This has given rise to a number of issues. Although inspections are to be done on a cost-recovery basis, the per diem rates have not been updated since the MOAs were signed and do not reflect the actual costs incurred by Transport Canada in conducting inspections on behalf of provinces. Federal inspectors conducting provincial inspections do not always have a full suite of enforcement powers under the MOA, and once they identify an issue to the Province, may not be involved in the follow-up. Finally, given that there have been multiple rounds of amendments to the *Railway Safety Act* since the MOAs were originally signed, aspects of these agreements may no longer reflect the operational realities of railway companies today.

The development or review of MOAs would provide an opportunity to update provincial rail safety regimes, and to clarify the roles and responsibilities of both the provinces and Transport Canada with respect to inspections, safety management systems (SMS) and enforcement activities. It could also be a first step towards greater alignment and harmonization in the rail safety regime across Canada.

> **"Our short line company operates in several provinces with different federal and provincial requirements – particularly regarding SMS. 'Managing the complexity' has become necessary. Our approach is to develop our own safety system which includes the most rigorous requirements and then manage all the small differences of the various jurisdictions. It would be a lot better if there was some standardization across jurisdictions, because these small differences create a lot of paper, but do not help me to manage my risks."**
>
> ***Short Line Railway Company***

Throughout the Review, we have heard from stakeholders about how different requirements across jurisdictions have created a complex regulatory environment, as well as unnecessary duplication of administrative requirements. For example, some provinces have implemented SMS requirements of their own, which incorporate some elements of the federal SMS requirements, but with slight differences. The Review has been told that as a result of this, some short line companies that operate within more than one province have had to produce multiple SMS to fully comply with regulations in each jurisdiction.[252] This not only results in additional costs for railway companies, but also creates duplicative administrative requirements that serve no real purpose in terms of improving safety outcomes.

Determining where these types of misalignments are occurring, and how they can be rectified, requires communication and collaboration among provinces/territories and the federal government. To ensure that necessary efforts to better align rail safety regimes across many jurisdictions are successful, there must be leadership from the most senior levels of government. There is a need for renewed engagement at the ministerial level (e.g., Council of Ministers Responsible for Transportation and Highway Safety) in order to address persistent, cross-jurisdictional rail safety issues. Rail safety should be a recurring agenda item at annual meetings of the Council of Ministers, which would help to raise the profile of persistent rail safety issues, promote intergovernmental approaches to address them, ensure that rail safety remains a shared priority over time, and encourage additional engagement in working-level discussions.

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[252] CANDO Submission, p. 5.

Recommendation 9 – Recognizing that rail safety issues, including governance and proximity, are a shared responsibility and require extensive collaboration among governments as well as railways, it is recommended that:

A. **there be an ongoing institutional ministerial-level mechanism (with appropriate working-level support) to identify, address and resolve rail safety issues (e.g., Council of Ministers Responsible for Transportation and Highway Safety and government departments responsible for land use planning); and**

B. **Transport Canada work with the provinces/territories to establish or update rail safety Memoranda of Agreement in order to ensure greater clarity and consistency in rail safety regimes across jurisdictions.**

5.1.2 Local Railway Companies and Safety Management Systems

It is sometimes necessary for provincially-regulated railway companies to use federal track as part of their operations. When the *Railway Safety Management System Regulations, 2015* came into force, the scope of the Act was expanded to include these railways as local railway companies, which must have a federal SMS. This can include short line railways, light rail transit companies, tourist trains and in some cases, industrial operations and grain elevators.

The Review has heard from local railway companies, provinces and Transport Canada SMS auditors that, in some cases, these requirements are too onerous and not commensurate with the risks posed by a local railway. This is because the federal regime imposes most of the same SMS requirements on small operators engaged in low-risk activities as they do on larger companies that transport dangerous goods at higher speeds. Stakeholders have suggested that a tiered approach or exemptions from certain regulatory requirements would be more appropriate for smaller, lower risk operations.[253]

> "Of all the local railway companies in our Region, only a handful have operations whose risk level warrants a full SMS. Strictly speaking, if we are truly aiming to allocate resources according to the risk level, then we shouldn't be spending time and audit resources on some of these operations."
>
> *Regional Manager, Surface Branch, Transport Canada*

There may be some cases where short, limited uses of federally-regulated track do warrant additional safety management measures (e.g., transporting dangerous goods, operating in a high volume area, increased train speeds). Implementing an exemption process would allow Transport Canada to assess the risks of operations on a case-by-case basis and outline the criteria needed to determine whether or not the removal of some or all SMS requirements is warranted.

Further, some local railway companies may be required to have both a provincial and federal SMS, subjecting them to multiple SMS audits. Through the MOA renewal in Recommendation 9, it may be possible to formally recognize equivalency when a province has a separate SMS requirement. Removing the need for federal SMS audits when it is deemed that an appropriate provincial safety management regime is in place would benefit local railway companies by avoiding regulatory duplication. It would also help Transport Canada, which could then focus its auditing resources on higher-risk operations.

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[253] Ontario Ministry of Transportation Submission. p. 3-4; Alberta Ministry of Transportation Submission. p. 14; Manitoba Infrastructure Submission. p. 2.

Even with an exemption, local railway companies operating on federal track would still be required to obtain a federal Railway Operating Certificate, thus proving that they meet the safety standards needed to operate. These companies would also still be required to meet safety requirements under the Act, including all applicable rules and regulations, and Transport Canada would continue to undertake inspections and enforcement actions, as needed.

Recommendation 10 – It is recommended that the *Railway Safety Act* be amended to allow local railway companies to request exemptions from elements of the SMS regulations where SMS requirements would have limited safety benefits for their operations. The exemptions should be risk-based, time-limited and require local railway companies to notify the Minister if there are any changes to the operations or class of goods being carried by a company with an existing exemption.

5.1.3 Urban Transit Authorities

Local railway companies include provincially-regulated Urban Transit Authorities (UTAs) operating on tracks owned by federally-regulated railway companies. In a joint submission,[254] the UTAs of Metrolinx (Toronto), Réseau de transport métropolitain (Montreal) and TransLink (Vancouver), which together move almost 100 million people each year, called for greater consideration to be given to commuter-focused rail operations under the *Railway Safety Act*, because certain regulations, standards, policies and rules developed for freight operations do not make sense in a commuter rail context.

The UTAs also noted a number of gaps and/or duplicative regulatory requirements between the federal and provincial rail safety regimes, such as regulations related to crossings and whistling, methods of addressing threats to safe operations on land adjoining commuter rail trackage and the lack of access by Urban Transit Authorities to information on dangerous goods transported by freight trains either over or in close proximity to commuter railway owned-tracks or stations.

To address these regulatory gaps and duplication, the UTAs recommended that specific provisions related to the distinct class of "Urban Transit Authorities" be formally adopted and included in the Act and that consideration be given to granting dispatching priority to passenger rail over freight rail on host federal railway tracks. Of note, the Government of Ontario also indicated a need for better information-sharing practices around dangerous goods travelling on provincially-owned tracks, and encouraged the federal government to consider unique urban transit needs and operations when determining whether to grant an exemption to a federal rail safety regulation, rule, engineering standard or policy.[255]

The Review is sensitive to the unique challenges faced by UTAs, and recognizes that while they are considered local railway companies according to the Act, their scale and importance is different from most other railways in this category. That said, it appears to the Review that many of the issues put forward by UTAs could be addressed by implementing some of the other recommendations in this Report. For example, renewing the Memoranda of Agreement and improving dialogue among provinces/territories and the federal government (i.e., Recommendation 9), as well as the review of federal rules (i.e., Recommendation 13) would help resolve many of the jurisdictional issues that the UTAs are facing. Similarly, implementing the recommendations on technology (i.e., Recommendations 4 and 5) could provide a platform for commuter rail to build upon in seeking out more advanced commuter rail technology available in other jurisdictions (i.e., Europe, Japan).

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[254] Metrolinx, Réseau de transport métropolitain and TransLink Submission.

[255] Ontario Ministry of Transportation Submission. pp. 1-2.

5.1.4 Short Line Infrastructure Investment

Canada's federal railways are classified by their annual operating revenues. Class 1 railways have operating revenue exceeding $250 million (i.e., CN, CP, VIA Rail), while a railway with operating revenues under $250 million is often referred to as a short line. Short line railways are an important part of Canada's economy, with over 50 short line railway companies owning roughly 20 per cent of the national rail network, and transporting approximately $20 billion worth of freight every year.[256] Short lines provide regional connectivity to the main rail network, while reducing wear on road infrastructure and reducing emissions.

These operations are capital-intensive. On average, short lines maintain an operating ratio of 90 per cent and invest an average of about 12 per cent of their revenues into capital expenditures. In comparison, Class 1 freight railways maintain operating ratios in the 60 per cent range, and can reinvest up to 20 per cent of their revenues into capital expenditures.[257]

The Review heard repeatedly about the challenges faced by short line railway companies. Over the past 10 years, there have been increasing financial demands on short line railways resulting from new regulatory requirements related to dangerous goods, grade crossings, SMS and carbon taxes. In addition, a new federal liability and compensation regime for the shipment of crude-by-rail under the *Canada Transportation Act* (CTA) has also put pressures on narrow operating margins, because the current compensation regime does not cover accidents on provincially-regulated track. As such, short line railway companies that handle dangerous goods are required to purchase comparable, private liability insurance (i.e., $25 million coverage) for operations where trains travel at much slower speeds because of track limitations.

In consultations and submissions, short line railway companies, the RAC and all of the provinces that provided submissions to the Review also raised significant concerns about the lack of application of the federal fund for railway accidents involving crude oil to provincially-regulated railways. While the *Canada Transportation Act* falls outside the mandate of this Review, these issues are noted here to further illustrate the scope of challenges that short lines face.

Transportation demands and technology advancements have led to investments by Class 1 railways in infrastructure upgrades that allow the operation of longer and heavier trains. Many short line railways operate on infrastructure not designed to accommodate similar train movements, which forces short lines to operate trains at lower speeds to maintain the equivalent level of safety. The result is reduced network fluidity, more congestion and reduced overall efficiency in moving goods to market. Immediate and long-term capital investment is required to meet increasing regulatory obligations, rehabilitate or replace aging critical infrastructure, increase capacity to accommodate heavier traffic and, in general, improve safety conditions.

Short lines are eligible to submit proposals for grade crossing improvements under the Rail Safety Improvement Program (RSIP); however, of the 110 grade crossing projects funded in 2017–18, two were from short lines, 48 were from the Class 1 railways, and the remaining were from provinces and municipalities for the road portion of the crossings. One short line operator indicated that they submitted 14 projects in 2017 and none were funded, and that they were unlikely to try to use the program in the future as the application process required resource commitments, with no benefit. Smaller railway companies and communities are often the ones least able to afford investments in these projects.

Other infrastructure funding sources (e.g., Trade and Transportation Corridors Initiative), are assessed through a competitive, merit-based process that: examines how a project would respond to a demonstrated need to meet the programs objectives; favours leveraging funding from multiple partners; and prioritizes projects on a national, and in the case of the Canada Infrastructure Bank, a transformative basis. This makes it extremely difficult for short line railway company projects to be funded as they are often regionally-based operations.

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[256] Railway Association of Canada. Rail Trends 2016. p.15.

[257] Railway Association of Canada Submission. p. 24.

The 2015 CTA Review performed an extensive review looking at the economic pressures on short line railways and provided two recommendations aimed at improving investment in short line infrastructure.[258] This included the recommendation to implement something similar to the US Railroad Track Maintenance Tax Credit, known as the 45G tax credit, which grants an amount equal to 50 per cent of qualified track maintenance expenditures and other qualifying infrastructure projects. While the 2015 CTA Review's conclusions were focused on network capacity and overall competitiveness, these infrastructure improvements would have the additional benefit of improving safety, and allowing the short line to invest in other safety-related initiatives.

This Review agrees that the existing funding programs are not sufficient for short lines. The federal government should look at all existing infrastructure funding programs and other potential funding models, including Transport Canada's Airports Capital Assistance Program[259] in order to determine the most appropriate option to support safety-related improvements by short line railways. Improvements in funding accessibility and eligibility for short lines will improve public safety, as well as benefit the economy.

Recommendation 11 – In recognition of the vital role of short line railways in Canada's national transportation system, and the challenges they have in funding safety-related infrastructure improvements, it is recommended that:

A. funding under the Rail Safety Improvement Program allocate a portion specifically for grade crossings involving railways other than Class 1 railways; and

B. the Government provide additional financial support programs for short line infrastructure investment to improve safety.

5.2 Rules

Issue: Rules are an effective policy instrument but aspects of the rules-development process limit transparency and engagement opportunities for relevant parties

Challenge: Maintaining the effectiveness and timeliness of the rules-development process, while increasing transparency and keeping existing rules clear and current

As noted in the 2007 RSA Review, "[t]he basic principle introduced by the *Railway Safety Act* (RSA) was that railway companies must be responsible and accountable for the safety of their own operations, while the regulator must retain the power to protect people, property, and the environment by ensuring that the railways operate safely within a national framework."[260] The Act's unique feature of providing for the development of rules by industry on certain matters related to the operation and maintenance of railways is consistent with this principle. Rules can be developed by a railway company on its own initiative, or the Minister may order the industry to develop a rule on a safety matter in the following areas: maintenance of line works; rail equipment; security; training of personnel; and designation of safety-critical positions. Under the Act, the Governor in Council has exclusive regulation-making powers over matters of: crossing safety; managing rail safety risks on lands adjoining railways; and SMS.

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[258] 2015 *Canada Transportation Act* Review. *Pathways: Connecting Canada's Transportation System to the World: Volume 1.* December 2015. Chapter 8: Rail Transport Recommendation 2(c) and 3. pp. 129 and 130.

[259] Transport Canada. Airports Capital Assistance Program. Website.

[260] 2007 *Railway Safety Act* Review. p. 40.

Rules differ from regulations in two important respects. First, a rule applies only to those railway companies that are signatories to it, whereas regulations have general application across the industry. Secondly, rules formulated by the railways require only the approval of the Minister of Transport, as opposed to regulations, which are made by the Governor in Council pursuant to the Government process on regulatory development, including the development of the Regulatory Impact Analysis Statement and publishing for public information/consultation in the *Canada Gazette*. Nevertheless, once approved by the Minister, rules have the same force and effect as regulations. Regulations take precedence over rules, and regulations can be made that supersede rules at any time.

There are 20 Governor in Council Regulations under the Act.[261] There are currently 15 distinct rules under the Act.[262] The *Canadian Rail Operating Rules* are by far the largest and most complex, consisting of 100 pages covering most rail operating issues such as train movements and traffic control. One rule has been added since the 2007 RSA Review, the *Rules Respecting Key Trains and Key Routes* (Key Trains Rule), and amendments have been made to five other rules over the same period.

Under the Act, the rule-making process requires that a railway company consult with relevant organizations and associations affected by the rules 60 days prior to submitting it to the Minister. Relevant organizations and associations, as defined, only include associations representing persons employed by the railway company, or persons leasing rail equipment used. When submitting a proposed rule, the railway must identify each association that was consulted and attach a copy of any objections raised on the grounds of safety. Once a rule is submitted to the Minister, there is a 60-day assessment period for the Minister to assess the rule. This period may be extended by the Minister at their discretion. The Minister may also seek external advice from any person or organization having expertise in matters relating to safe rail operations. Once assessed, the Minister may either approve or reject the rule or can specify terms and conditions for its approval. If the Minister rejects the company-submitted rule, the Minister may establish a rule directly.

The rule-making powers under the Act were reviewed in two previous independent RSA Reviews, in 1994 and 2007. The mechanism was seen to be a modern, efficient and effective form of government–industry "co-regulation" on matters requiring knowledge, experience and expertise from those that directly operate the system (e.g., railway companies and employees). The 2007 RSA Review rejected the premise that rule-making was a form of self-regulation, given that the Minister ultimately approves, enforces and can require a change to a rule or replace it with a regulation over the subject matter.[263] However, the 2007 RSA Review findings did point out a number of ways the rule-making process could be improved.

In response to the 2007 RSA Review recommendation for a regulated rule formulation process,[264] a Transport Canada–industry working group determined that, to avoid an additional regulatory burden, voluntary guidelines would be developed. On December 14, 2011, Transport Canada issued the resulting "*Guideline on Submitting a Proposed Rule or a Revision to a Rule under the Railway Safety Act*" (Guideline)[265] to outline the expectations for railway companies when they develop rules. The purpose of the Guideline is to:

- promote the spirit of collaboration and to confirm the willingness of the parties to work in an open cooperative fashion with the intent to improve the rule-making process;
- outline the processes that the various parties have agreed to follow when requesting or formulating rules;
- clarify the process to be followed when a railway company formulates and files proposed rules with the Minister, whether in response to an Order from the Minister or on its own initiative, for the Minister's consideration and possible approval; and

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[261] Transport Canada. Regulations. Website.

[262] Transport Canada. Rules. Website.

[263] 2007 *Railway Safety Act* Review. pp. 50-51.

[264] 2007 *Railway Safety Act* Review. Recommendation 10. p. 56

[265] Transport Canada. Guideline on Submitting a Proposed Rule or a Revision to a Rule under the Railway Safety Act. December 14, 2011.

- clarify the information and documentation that a railway company should provide to substantiate their proposal and assist the Minister in determining whether the proposal would be conducive to safe rail operations by the railway company.

What we have heard

While the rule-making process has been identified as a useful mechanism, the Review has heard a number of issues regarding the process itself. These include:

- provinces, unions and community groups have expressed concerns that the rules process is not transparent;
- railway companies have cautioned that the ministerial orders that direct industry to develop rules are overly prescriptive, preventing industry experts from providing alternative safety solutions and lacking the flexibility to allow an evolving industry to implement improved processes and technology;
- the rules-development process may not fully consider the realities of short line or local railway operations;
- some railways are signatories to rules that do not apply to them, which has caused issues during SMS audits; and
- many rules are outdated and require re-examination to ensure relevance, clarity, consistency and enforceability.

Roundtable session participants and submissions to the Review pointed out that, for the most part, any early consultation with stakeholders, including unions, municipalities and Transport Canada, in the rules-development process is limited to the minimum required consultations in the Act and is usually done by sharing a draft rule for comments, rather than having other key stakeholders at the table during the rule development.

The Review heard that railways typically form a working group to develop draft rules and then share them with Transport Canada and relevant associations and organizations. Both Transport Canada and unions have indicated that bringing them into the rule-development process at an earlier stage would be beneficial. This would ensure that concerns can be addressed earlier and alternative views are considered during a rule's initial drafting.

CP commented that Ministerial Orders mandating that industry develop a rule around a particular safety issue should define the safety problem or issue to be addressed, supported by evidence, and the desired outcome of a rule, without prescribing a specified operational solution.[266] This would allow industry subject-matter experts to find ways to meet the government-stated objectives of a rule that takes technical and safety aspects of railway operations into account. The Key Trains Rule, developed in the wake of the Lac-Mégantic accident, to reduce the speed of trains carrying certain dangerous goods in and around populated areas was given as an example. The Key Trains Rule was ordered by the Minister under Section 19 of the Act, and that Order was said to contain very prescriptive requirements that were essentially the framework of the Rule.

The Review also heard that rules are often developed with the Class 1 railways in mind, and at times, the operational realities of smaller railways or urban transit authorities have not been considered. While each railway company has the ability to submit its own rules, in recent years the practice has been for the RAC to develop a rule on behalf of its members and submit it to Transport Canada on their behalf. Non-RAC members, including local railway companies not otherwise under federal jurisdiction, may not be involved in the development of these rules. Once a rule is approved by Transport Canada, non-RAC members are given the opportunity to be a signatory to the rules, and often will accept them as is.

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[266] CP Submission. p. 40.

5.2.1 Consultation and Transparency

The Review believes that rules are an innovative, effective and appropriate instrument to govern the safety of rail transportation in Canada. It also believes, however, that it would be beneficial to clarify where regulations would be more appropriate. There is currently no policy or guidance that outlines when rules should be used over regulations, or where rules may not be the appropriate instrument to address particular risks or issues. In order to address this, Transport Canada should articulate a set of principles that outline what types of rail safety issues are most appropriately addressed by rules and what types should be addressed by regulation.

For example, given that a rule only applies to a railway company that is a signatory, Transport Canada could consider regulations when the intent is for the requirements to have general application for the entire railway industry (e.g., maximum hours of work, Key Trains Rule). The Guideline could also reflect the notion that Minister-ordered rules should present the issue, supported by evidence, and provide flexibility for the industry to propose solutions. Regulations might also be required in cases where another third party (e.g., municipality, province/territory, Indigenous group or private individual) is directly affected, or has a role to play in implementing the requirements. The regulatory process is specifically designed to engage Canadians, and could be used if there is a need for the Minister to consult more broadly on a particular issue.

Even where a rule is determined to be the appropriate instrument, there may be cases where additional consultations are required by the Minister in order to properly assess the proposed rule. Currently, the Minister's power to consult is very narrow and is limited to a person or organization with expertise in matters related to safe railway operation. In its 2016 Report, *Report 6 - An Update on Rail Safety*, the Standing Committee on Transport, Infrastructure and Communities noted that there was no legislative requirement for communities to be involved in the formulation of rules. It recommended that "advance notice and opportunity for consultation with municipalities be provided on rules and exceptions to rules."[267] In response to this recommendation, Transport Canada agreed that there was value in the insights provided by municipalities and committed to introducing a mechanism to provide notice of proposed rules and rule exemption requests, to allow for comments from potentially affected communities.[268]

Expanding the scope of who the Minister can consult would result in a more transparent process and ensure that any stakeholders who may be indirectly affected (e.g., municipalities, technology companies) could be consulted by the Minister, as needed. The Review sees this consultation power as a targeted measure to discuss specific issues with known stakeholders, as opposed to general consultative power on rules. As discussed earlier, if there is a need for wide-ranging and broad consultations, then the regulatory process could be used.

5.2.2 Guideline for Submitting Rules

The Review believes that there are a number of items that could be included in the Guideline on Submitting a Proposed Rule or a Revision to a Rule to promote collaboration, and that a full review of the Guideline is needed to reflect the findings in this Report. Of note, the Guideline itself includes a section that commits to a periodic, collaborative review to assess and ensure its accuracy, relevancy and effectiveness.

In order to afford additional transparency and collaboration, and to provide the Minister with all the relevant viewpoints related to a rule proposal, the Guideline could require that railways provide both Transport Canada and the relevant association or organization with a written response to any comments or objections, even if the comments or objections are not strictly on the grounds of safety. This would provide additional transparency and show that all comments have been considered. Consideration could also be given to adopting a similar approach for consultation requirements related to railway requests for exemptions, as currently prescribed in the *Guideline on Applying for Exemption or Filing of a Notice of Exemption (December 2011).*

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[267] **Standing Committee on Transport, Infrastructure and Communities.** *Report 6 - An Update on Rail Safety.* **June 2016. Recommendation 18. p. 27.**

[268] **Hon. Marc Garneau, Minister of Transport.** Letter from the Minister of Transport to the Chair, Standing Committee on Transport, Infrastructure and Communities, House of Commons. **October 5, 2016. p. 8.**

The Review believes that the Rules process can be improved by implementing a number of measures to improve the transparency of the process. With enhanced collaboration, good will, and a shared commitment to safety, these measures can be implemented without impacting the flexibility or efficiency of this instrument.

Recommendation 12 – In order to provide additional transparency around the rule-making process, it is recommended that:

A. Transport Canada develop a policy that articulates in which cases regulations will be considered instead of rules and that all stakeholders be informed of these criteria;

B. the Railway Safety Act be amended to allow the Minister to seek advice from, or consult with, any relevant party in relation to a proposed rule; and

C. Transport Canada, in consultation with the railway industry, update the existing "Guideline on Submitting a Proposed Rule or a Revision to a Rule under the Railway Safety Act" to:

- **ensure that relevant associations and organizations and Transport Canada are involved earlier in the development and drafting of proposed rules; and**
- **ensure the railway includes all comments received, along with the railway's response to each.**

5.2.3 Review and Interpretation of Existing Rules

Transport Canada inspectors have indicated that some rules are not adequately clear and cause enforcement issues, especially with terminology such as "when practicable," or with missing definitions (e.g., rules related to switching operations, yet switching is not defined). This type of language can make it difficult for inspectors and railway companies to interpret requirements consistently or cause issues where there is a difference of opinion on the practicality of performing a given activity. While ideally these issues should be caught during the review of a rule, it is possible that the problem only arises once railway companies operationalize the rule and inspectors are assessing compliance.

Transport Canada has confirmed that 'official' rule interpretations are the purview of the Minister, as the Minister approves the rule. However, departmental rule interpretations are not easily accessible, and it is not clear that there is a defined, consistent process by which they are shared with inspectors and industry.

Transport Canada and the railways should review existing rules and look for areas to improve rule readability and clarity and, therefore, improve safety by ensuring that all railways, their employees, and Transport Canada inspectors are interpreting a rule in the same way. One way to address this issue would be to have railways amend an unclear rule, either on their own accord or by Order of the Minister that specifies the issues to be clarified. Another option would be for the Minister to issue rule clarifications or interpretations. A collaborative process could be used in developing interpretations involving the RAC and other affected railway companies. These interpretations would then need to be shared with all railway companies that are signatories to the rule, as well as all Transport Canada inspectors. It would be important to ensure that interpretations are easily accessible on Transport Canada's website, similar to Advisory Circulars posted on Transport Canada's Civil Aviation web page.[269]

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[269] Transport Canada. Regulatory Documents: Advisory Circulars. Website.

Industry has indicated that rules and regulations can stand in the way of innovation. As discussed in the Technology and Innovation section of this Report (i.e., Section C, Chapter 3), Transport Canada needs to be open to the possibility of using technology to replace outdated requirements. The nature of the rule process means that the railways have the ability to propose rule changes on their own, and Transport Canada would need to review and determine whether any proposed changes would meet the same safety objectives. However, this does not mean that rules provide unlimited flexibility for industry.

Any performance-based requirements must be written in a way that allows an inspector to ensure that a given process is safe, clearly assess compliance and take enforcement action, if necessary. For this approach to work, both Transport Canada and the railway industry must understand the expectations of how safety objectives, or equivalent level of safety, will be defined and evaluated. Understanding the expectations of the regulator would allow the railway industry to propose changes to rules to provide the flexibility to adapt to technological innovation.

The flexibility of the rules process is such that every federally-regulated company could have a different set of rules, for which Transport Canada would need to provide oversight and interpretation. In order to manage the requirements for inspectors, the Act provides the power to the Minister to ensure that rules are uniform when applying to like matters. While it may not be practical to have a different rule for every railway company, it may be possible to have a slightly different set of rules for Class 1, short line and commuter railways that meet the same safety objectives. The industry and Transport Canada should ensure that the rules-development process takes these differing classes of operations into account.

Recommendation 13 – It is recommended that Transport Canada, the Railway Association of Canada and railway companies work together to update rules or provide interpretation guidance for rules and regulations, as necessary, in order to:

A. ensure that rules are relevant, clear, consistent and enforceable;

B. account for operational differences between Class 1 railways, local/short line railways or commuter railways; and

C. provide the flexibility to allow technological innovation, where applicable.

These principles should also be considered when submitting new rules and should be reflected in the Guideline.

5.3 Engagement and Collaboration

Issue: Challenges in sustaining ongoing collaboration among railways, governments, non-government organizations and communities is making it difficult to coordinate collective efforts to address unresolved issues affecting rail safety

Challenge: Transport Canada taking on a leadership role to ensure ongoing dialogue between a broadened and diverse range of actors in the rail safety regime

Collaboration to address long-standing issues

Many of the key issues that we have discussed in this Report are impossible to resolve without collaboration and cooperation across all levels of government and between multiple groups of stakeholders. This includes land use planning around federally-regulated railway tracks, grade crossing and trespassing issues, and duplication and inconsistencies caused by disparities in safety management system requirements across different jurisdictions in Canada for local railways.

RAILWAY SAFETY ACT REVIEW ROUNDTABLE SESSION, CALGARY, ALBERTA, NOVEMBER 1, 2017

When organizing the regional and thematic roundtable sessions, efforts were made to include a diverse array of voices, including community interest groups, academics, unions, Class 1 and short line railways, land planning authorities, emergency responders and municipal and provincial/territorial representatives. As the sessions progressed, not only was the Review learning a great deal from those who attended, but participants were also learning from each other. Some attendees were unaware of available tools, information and training, and many were surprised by the level of cooperation that was currently in place between emergency responders and railways. Bringing such a broad representation of stakeholders together, rather than meeting with them individually, proved to be a great learning opportunity for everyone involved.

As rail safety issues often involve shared responsibility among governments, railways and a variety of community groups, the solution to improving dialogue requires both federal leadership and active efforts on the part of provinces/territories and municipalities to make the most of engagement opportunities.

It was observed that some provinces/territories and municipalities were not necessarily fully appreciative of the role that they can play in contributing to, and resolving, rail safety issues. For example, land use decisions made by provincial and municipal authorities (such as building schools close to railway tracks without grade separated crossings, or allowing new condominiums to be built adjacent to rail operations) can have a significant impact on safety around federally-regulated tracks. Similarly, outreach by provincial public health and education authorities (e.g., providing mental health services focused on suicide prevention, and teaching young Canadians about the dangers of trespassing on railway tracks) can help to significantly reduce rail safety risks. In some cases, rail safety around federally-regulated tracks was viewed as primarily a federal concern rather than a shared responsibility.

Moving forward together

Undertaking meaningful dialogue across multiple jurisdictions, particularly when involving municipalities, requires a great deal of sustained effort to build and maintain effective two-way communication. Engagement requires an active exchange of information between all participants, and it can take time to come to agreement on the best way forward when local and regional realities come into play.

To achieve this, Transport Canada should build capacity for community outreach and public engagement on rail safety matters and strengthen connections with communities and government officials across Canada. This will require dedicated resources, to engage with other jurisdictions to better understand their perspective on local railway issues, to keep abreast of their rail-related plans and activities, and to serve as a point of contact for Canadians with rail-related questions or concerns.

This last point is particularly important because responsibility over rail-related matters is split across multiple departments and agencies, and across multiple directorates within Transport Canada. The average Canadian does not see the distinction between these organizations when they seek an answer to a rail-related concern, and finding the right person to contact can be a frustrating experience.

5.4 Transparency and Public Trust

Issue: Canadians are taking a greater interest in rail safety matters and seeking more information than currently available to help them to: understand the rail safety regime; feel reassured that good work is being done; and effectively engage on addressing issues

Challenge: Enhancing communication platforms and transparency with respect to the information Transport Canada and the railway industry make available to the public, in order to strengthen public awareness of, and trust in, Canada's rail safety regime

The devastating consequences of the accident in Lac-Mégantic brought rail safety issues and Transport Canada's oversight role into sharp focus. Beyond the impact on the town and its inhabitants, the accident damaged public trust in Transport Canada and the railway industry. As a result, although both the government and the railway industry have made significant changes and taken concrete measures to improve rail safety, Transport Canada has remained under sustained and intense scrutiny for the past several years. In this environment, the government's assurances are often not enough to convince the public that rail transportation is safe and secure, despite a general downward trend in major rail accidents. Canadians concerned with rail safety, community groups, as well as some municipalities, are requesting better access to information and a greater say about the trains that travel through their communities.

Public acceptance of a company's or industry's operations, sometimes referred to as a "social licence to operate", is starting to affect the ability of some organizations to successfully conduct their business. Maintaining acceptance requires active, ongoing efforts on the part of companies to develop trust and positive relationships with communities, even in areas where they have been legitimately operating for a long time. A loss of trust can result in public opposition and ultimately limit industry operations, as has been the case in recent years on a number of resource development projects, preventing some from moving forward altogether. Although the Canadian public appears to appreciate the value of rail transportation for Canada, the Review believes that both the railway industry and federal government should nevertheless take additional measures to maintain public confidence in the rail safety regime so that the rail system can continue to serve the key economic needs of the country.

In the context of rail transportation, a loss of confidence in the safety of the rail network could result in public pressure to restrict trains, particularly those carrying dangerous goods, from travelling through certain routes or communities. It could also cause opposition to the construction of new tracks and affect the movement of trains along Canada's key strategic trade corridors. Given the wide variety of goods transported by rail, which include agricultural and food products, natural resources, machinery and motor vehicles and manufactured goods moving across thousands of kilometres on a daily basis,[270] it is easy to see how disruption to rail operations could have serious consequences for Canada's economy, and impact the day-to-day lives of Canadians.

Moreover, a shift away from rail transportation would leave transportation by road as the main alternative. In addition to increased shipping costs, longer travel times, road congestion and strain on public infrastructure, this would also have environmental impacts due to higher emissions released by trucks, and the safety risks of transporting goods to market would be shifted to the road network.

Steps toward transparency

It was evident from discussions with stakeholders, particularly community associations and municipalities, most notably, Lac-Mégantic, that improving transparency is essential to rebuilding confidence in the rail safety regime.

> **"While I don't need to know the real-time, detailed contents of each train that goes by, I do, however, want some assurance that the people who need to know this information, such as first responders and municipal planners, do have access to it. There isn't enough publically available information that gives me confidence that railways and regulators are doing what they should to keep rail operations safe."**
>
> ***Rail Safety First, Community Organization***

While technically beyond the scope of this Review, one of the most common suggestions given by stakeholders was that Protective Direction No. 36 (PD 36), which requires Class 1 railways that transport dangerous goods to submit reports to designated emergency planning officials on the nature and quantity of dangerous goods transported through their jurisdiction on a regular basis, should be made permanent through regulations. Community representatives that reached out to the Review had overwhelmingly positive things to say about PD 36, and indicated that the information that emergency personnel receive is useful and the government should ensure that the practice continues.

The Review also received submissions and comments during roundtable sessions requesting that real-time information on dangerous goods be made available to emergency responders so that they can more quickly assess risks and determine the appropriate response in the event of an accident. The Review notes that this information is available via the AskRail application, which was developed as a collaborative effort by Class 1 railways in Canada and the US. AskRail can be downloaded to mobile devices and used by qualified first responders with authorization from the railway companies. The application is used to determine whether a rail car is carrying dangerous goods, the nature of those goods, and emergency contact information for the responsible railway company. The Review believes that initiatives like the AskRail application are a step in the right direction in terms of getting information to those who need it.

At roundtable sessions and in meetings with municipalities and community groups, the Review learned that some were aware and complimentary of AskRail, but others were not aware that this useful application existed. Given the number of stakeholders who asked that something similar be put in place, the availability of this application may need to be more widely promoted to assure the public that qualified emergency personnel have access to this information.

While the changes put in place by Transport Canada and the railway industry over the last several years improve on what existed before, the Review believes that they can go further, which will require work to better meet the principles of transparency and openness.

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[270] Railway Association of Canada. Rail Trends 2017. p. 11.

The way forward

Data should be open by default. When determining what information should be available to Canadians, the onus should be on Transport Canada and the railways to make a strong case for why specific information should be withheld. While there are instances where the release of information could potentially have adverse impacts on public safety and security, and this must always remain the chief consideration for any decision on what to reveal, that still leaves a significant amount of data that could be made public.

In particular, the Review believes that Transport Canada should strive to better explain the overall rail safety regime by posting information on rail-related oversight activities (e.g., inspections and safety management system audits) on its website. This will add to the information the Department already publishes related to its compliance and enforcement activities, such as monetary penalties, notices and orders, and prosecutions. Providing the public with information on oversight activities would allow Canadians to gain insight into how inspections are conducted, including the nature of violations found and the actions taken by specific companies to resolve them in a timely manner.

The National Energy Board (NEB) website can serve as a model in this regard. The NEB, which regulates pipelines, energy development and trade, posts inspection reports, audits and remedial activities online for the public to view. The NEB's website also includes an interactive data hub, which users can access to see where accidents have occurred and find details on those accidents, including the companies involved and the type of accident that took place.

Transport Canada should build a similar feature on its website for rail safety. An interactive map showing rail lines, and information about the companies that own and/or operate on those lines, grade crossing locations and the location of rail accidents and incidents would allow Canadians to learn about rail safety in their communities. This information could also alert municipalities to issues affecting particular crossings under their jurisdiction and be helpful for researchers aiming to contribute to the advancement of rail safety. Much of this information is already collected by, or available to, the Department. The challenge would be to present it to the public in a useful, creative and accessible way.

Throughout this Review, it has been observed that while Transport Canada's rail safety website contains ample amounts of helpful and well-written information, it is spread throughout the site and can be difficult to find. Better linking between related sections and indications of where to learn more would make the site easier to navigate and would help ensure that the information reaches its intended audience more effectively.

The public identification of safety violations, as well as flaws in companies' safety-related processes and procedures may raise several concerns in terms of potential liability and lack of understanding by the general public. These potential risks can be mitigated and can be offset by the advantages of a better educated public and communities concerning rail safety activities and initiatives.

While recognizing that some of these actions would take time to implement, the Review believes that this is a necessary step towards building public confidence in the safety of Canada's rail transportation system. Being more open with information, providing tools that can be used to learn more about rail safety, and ensuring that the departmental website is organized in a clear, intuitive and accessible way will help Canadians become more informed on the current safety and security of the rail system, and the measures that both the government and industry are taking to continue to improve the rail safety record. It will also ensure that when working together to address rail safety issues, communities, industry, regulators and academics will be able to work from the same information.

Recommendation 14 – To uphold the principles of openness and transparency, engage in more meaningful dialogue with Canadians and help build public trust in the rail safety regime, it is recommended that Transport Canada, with the help of railways where needed, expand its engagement activities by:

A. publishing information on Transport Canada's oversight activities and railway remedial activities alongside the enforcement actions already available online;

B. developing and maintaining a publicly accessible interactive map tool that can provide information about the railway system including rail lines and owners, grade crossing locations and details, and accident/incident information;

C. modifying the departmental website to transform it into a more effective tool to inform the public and communities; and

D. building capacity for community and municipal outreach and public engagement activities on rail safety matters within Transport Canada.

SECTION D:

CHANGES TO THE ACT FOR EFFICIENCY AND EFFECTIVENESS

In framing this Report, the Review chose to focus its efforts on persistent issues in rail safety. The decision to keep to a small number of recommendations was intended to allow Transport Canada to target its efforts where it could achieve the best safety outcomes. However, there were a number of issues brought forward during consultations with stakeholders that, while not central to this Review, merit consideration. These issues are addressed as follows.

1) Rail Security and Cyber Security

Security provisions in the *Railway Safety Act*

In contrast to the robust security measures implemented for aviation, the security regime for rail transportation in Canada is in an early stage of development.

The Act has a range of security-related powers. To date, few of these powers have been used and there are no security regulations adopted under the Act. There are also no security measures, security-related rules, or security-related emergency directives currently in place.

To support rail security, Transport Canada has a Memorandum of Understanding with the Railway Association of Canada and its members respecting security practices. Under this agreement, signatories have implemented a number of basic security measures and practices including conducting risk assessments, developing security plans and training employees. However, the requirements are voluntary and as such are not enforceable. In addition, Transport Canada is currently in the process of developing regulations respecting security for the transportation of dangerous goods under the *Transportation of Dangerous Goods Act*, and for passenger rail under the *Railway Safety Act*.

The lack of rail security regulations and the voluntary nature of existing security measures has made it difficult for the Review to fully assess how well the security-related components of the *Railway Safety Act* are functioning. However, through discussions with stakeholders, a few issues have come to light.

Safety focus of the *Railway Safety Act*

Although the Act was implemented in 1989, security-related provisions in the Act were only added in 1999. The bulk of Transport Canada's efforts to improve the rail safety regime since the Act was adopted have focused on the safety aspects of the system. Consequently, the sections of the Act dealing specifically with safety tend to be more detailed and specific than those addressing security, which are typically more general in nature. While many parts of the Act provide the Minister of Transport or the Governor in Council with authorities that apply to both safety and security, in some areas the authorities refer specifically to safety without any mention of security. Examples include, but are not limited to, the following: the sections on safety management systems; the maintenance and filing of documents to the Minister of Transport; the authority of associations, organizations and railway companies to object to proposed rules on the grounds of safety when security should also be considered; and authorities to allow inspectors to enter land adjoining a rail line to prevent or respond to a threat to rail transportation, or to restore operations on that line. While the lack of an explicit reference to security in these provisions does not necessarily indicate that they cannot be used for security purposes, Transport Canada should take the opportunity to add security-related language where appropriate the next time that the Act is amended.

French and English provisions should also be compared at this time, because there are several areas in the Act where translations do not clearly match. For example, Subsection 4(1) includes a reference to trains in the French provision that is not present in the English version, and Subsection 33(1) where the French version omits a reference to security.

Cyber Security

There is an emerging risk that falls within the realm of cyber security, particularly as evolving technologies are being driven by communications and connected computing, as was discussed previously in the Technology and Innovation Chapter of Section C. As new technologies are adopted to improve the safety and efficiency of the rail transportation network, Transport Canada must be mindful of the potential for new vulnerabilities that can pose security risks.

Cyber attacks, which include hacking, infection with malware or viruses and physical attacks also pose a threat to rail safety.[271] High-profile examples of cyber attacks affecting rail operations include a 2008 case in Poland where a teenage boy modified a TV remote to trigger rail switches, causing four trains to derail, as well as a case in 2011 where railway signals in the northwestern US were disrupted for two days by hackers who attacked a railway company's computers.[272] [273] [274]

The Act is silent on issues of cyber security, and there are few cyber security guidance documents and standards specific to rail operations.[275] Although the security Memorandum of Understanding and the proposed regulations concerning transportation of dangerous goods and passenger rail security do not address cyber security directly, they are expected to require railway companies to implement a security management program that can be expanded to address cyber security risks. The security plan, associated general awareness training, risk assessment, the security coordinator role and incident reporting activities are all necessary components in a cyber security context and can therefore be adapted to address cyber security.[276]

Because the cyber security landscape is rapidly changing and extends well beyond the rail sector, Transport Canada should continue to monitor for developments or emerging needs related to cyber security that are not already incorporated into the security provisions of the Act, the *Railway Safety Management System Regulations,* or Canada's Cyber Security Strategy. The Department should also look at whether the Act is the most appropriate legislation to address the issue of cyber security, or if it would be better dealt with under a broader piece of legislation at the federal level.

2) Transportation Appeal Tribunal of Canada Decisions

The Review heard from railway companies that some of the authorities respecting the Transportation Appeal Tribunal of Canada (the Tribunal) are an irritant.

The Tribunal is responsible for holding hearings to review or appeal enforcement and licensing decisions by Transport Canada for the rail, marine, air and international bridges and tunnels sectors. The Tribunal provides people or companies affected by these decisions an opportunity to challenge them by means of review by an independent and quasi-judicial body. Requests can be made to review decisions on the following: rail safety inspector notices and orders; administrative monetary penalties; the designation of screening officers; and the issuance, suspension, or cancellation of Railway Operating Certificates, among other matters.

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[271] Critical Systems Labs. *Proposal: Impact of Cyber Security Threats on Rail Safety*. p. 2.

[272] Graeme Baker. "Schoolboy Hacks into City's Tram System". The Telegraph. UK. January 11, 2008.

[273] Kim Zetter. "Hackers Breached Railway Network, Disrupted Service". Wired. January 24, 2012.

[274] Critical Systems Labs. *Impact of Cyber Security Threats on Rail Safety*. September 26, 2017. p. 12.

[275] Critical Systems Labs. *Impact of Cyber Security Threats on Rail Safety*. September 26, 2017. pp. 13-20.

[276] Critical Systems Labs. *Impact of Cyber Security Threats on Rail Safety*. September 26, 2017. pp. 34-36.

In some cases, such as for administrative monetary penalties across all modes of transportation, the determinations and decisions made by the Tribunal can overrule those of the Minister of Transport. In others, such as challenges of inspector orders and decisions on Railway Operating Certificates, the Tribunal may only affirm the original decision or refer it back to the Minister for reconsideration. In their submissions and in discussions with the Review, railway companies have expressed frustration with this aspect of the process.

While Transport Canada has an internal process for addressing referrals from the Tribunal, railways note that there does not appear to be a deadline by which the Minister must make a decision, which adds uncertainty to what is already a long process taking place over many months. In its submission to the Review, CN included examples of decisions referred back to the Minister by the Tribunal that have been waiting nearly a year without resolution.[277] In such cases, railway companies must continue to comply with the original inspector orders while they wait for a final decision, even when the Tribunal has indicated that it disagrees with the enforcement action.

To improve the transparency and predictability of this process, Sections 31.4 and 32.4 of the Act could be amended to include a maximum number of days within which the Minister must confirm, alter, or revoke the order concerned when it is referred by the Tribunal following a review or appeal, once Transport Canada has received required documentation from the Tribunal.

3) Notification of Work Near Pipelines

Submissions to the Review and discussions at the Calgary roundtable suggested that communications between railways and utility companies could be enhanced when planning construction or maintenance work where utility lines such as pipelines intersect with railways. Specifically, SaskEnergy, a crown corporation in Saskatchewan that operates pipelines, stated that it has not been able to reach agreement with federally-regulated railways on acceptable safety practices for work taking place near its natural gas pipelines, despite provincial regulations requiring consent from pipeline operators prior to commencing work.[278]

Background

Like railway companies, pipelines are under federal jurisdiction when they cross provincial or international borders and provincial jurisdiction when they are located entirely within a province. Federally-regulated pipelines are under the authority of the National Energy Board, which has set in place regulations requiring companies wishing to perform work near pipelines to obtain pipeline locates from One-Call centres, and to receive consent from pipeline operators for construction of facilities (e.g., roads, railways, fences) or for activities that may cause ground disturbances (e.g., digging, driving fence posts, clearing and stump removal) near the pipelines.

At the provincial/territorial level, regulatory requirements vary. Common requirements, such as those for Saskatchewan, include contacting One-Call centres or the pipeline operator directly for pipeline locations prior to beginning certain types of construction work or work that may cause ground disturbances near pipelines. In addition, an agreement with the pipeline operator is required on the precautions that must be taken to ensure that the pipelines are not inadvertently damaged once work is underway.

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[277] CN Submission. p. 35.

[278] SaskEnergy Submission. p.1.

Agreements between pipeline operators and companies or individuals concerning such work are important to ensure that it is done properly and safely. Damage to pipelines can cause significant environmental and economic disruption, and can also lead to serious injuries and deaths. Consequently, consulting with pipeline operators who have the knowledge and expertise to provide instructions on how to proceed is crucial to ensuring that work near pipelines can be carried out safely.

In discussions with the Review, SaskEnergy representatives indicated that railway companies typically do not communicate properly with them when needed. This includes notifying pipeline operators when rail accidents take place so that it can be determined whether any damage to pipeline infrastructure might have occurred. Further, although provincial regulations require crossing agreements prior to certain types of work being performed near pipelines, the Review was told that railway companies tend to disregard this requirement and go ahead with their planned work without notifying pipeline operators.

Similarities between this issue and the matter of land use planning near railway tracks mentioned earlier in this Report are notable. In the latter case, railway companies have indicated that developers tend to be unaware of the risks of building in close proximity to rail operations. As a result, railways have requested that municipalities be required to consult with them before construction related to new developments is authorized, to give railway companies an opportunity to inform developers and municipalities about the risks inherent to building in close proximity to rail operations. In this instance, it is the pipeline operators who are requesting that they be consulted so that agreement can be reached about the measures that must be taken to ensure that work is carried out safely.

Much of the focus of this Report has been on the necessity for various stakeholders to work together to improve rail safety. It appears that the same could be said for pipeline safety where these cross rail lines, and that better cooperation could be achieved in this area. A collaborative approach to modify the engineering standard developed under the Act that governs this practice would likely be a good starting point. Amendments to the Act could also be considered to clarify its provisions on this subject. Transport Canada's current standards, the *Standards Respecting Pipeline Crossings Under Railways* (TC E-10), address railway and pipeline crossing safety but only focus on the responsibilities of pipeline operators performing work near rail lines, with no corresponding obligations on railway companies to adopt any safety practices for work near pipeline crossings.

4) Compliance Agreements

The Act allows for graduated enforcement, providing inspectors with a set of compliance and enforcement options, and giving them flexibility to select the most appropriate tool for the circumstances. When a person or company is found to have contravened legislation, they may, among other things, be subject to letters of non-compliance, orders, administrative monetary penalties, and for serious cases, prosecution or suspension of Railway Operating Certificates.

While current enforcement tools are robust and serve their purpose well, there have been innovations in approaches to enforcement in other statutes that, if adopted as part of the rail safety regime, would improve its flexibility with respect to enforcement options and, in turn, potentially result in improved safety outcomes.

The Review believes that the Act could be amended to allow the Minister to enter into a compliance agreement with a person who has been issued a Notice of Violation as an alternative to that person paying an Administrative Monetary Penalty (AMP). Under this type of agreement, the person must commit to rectifying their non-compliance, and there are penalties for failing to do so.

Examples of compliance agreements can be found in the *Canada Consumer Product Safety Act* and the *Agriculture and Agri-Food Administrative Monetary Penalties Act*. In these acts, compliance agreements require that the person rectify their non-compliance, and may include terms and conditions, which can include a provision that a security be deposited pending compliance, or that the AMP be reduced or eliminated following compliance.

There are also two other reasons the Review supports compliance agreements. Inspectors have noted that the work required to prepare an AMP is onerous due to the need to develop documentation that can withstand challenges. In addition, railway companies have noted that even when they have acknowledged and responded to the problem identified, the AMP process still continues and by that point, has limited safety value. Such agreements could prove helpful in increasing incentive for collaboration to address the systemic issues that led to the infraction, resulting in improved safety outcomes.

5) Mandatory *Railway Safety Act* Reviews

Canada, along with the rest of the world, is undergoing rapid social and technological changes that will have an impact on rail transportation. While the Act is effective in addressing today's challenges and well-positioned to address some of the challenges to come, in order for it to remain effective and ensure that rail transportation in Canada continues to be safe, efficient and serving the interests of Canadians, the Act will need to continuously evolve to adapt to new developments. In the interests of maintaining flexibility and effectiveness, the Act should contain a provision requiring regular, comprehensive legislative reviews, encompassing all of the regulations, rules, and programs under its umbrella. These reviews should be held at a minimum of once every 10 years.

Further, Transport Canada should consider requiring the next legislative review to look at the rail safety regime as a whole, including legislation and programs beyond the Act. Throughout our consultations, we heard comments and ideas from stakeholders that fell outside the scope of the Review's mandate. While some of the issues brought to our attention may be improved indirectly through the implementation of our recommendations, we believe that a holistic review of the rail safety regime under the Minister of Transport's authority is necessary in order to tackle interrelated issues that fall under the purview of multiple statutes and programs. These issues include but are not limited to the transportation of dangerous goods, the compensation and liability regime, and data collection.

Recommendation 15 – To clarify requirements in the *Railway Safety Act*, address jurisdictional gaps and improve the Act's flexibility and efficiency, it is recommended that Transport Canada address issues within the Act and supporting instruments, in the noted areas of:

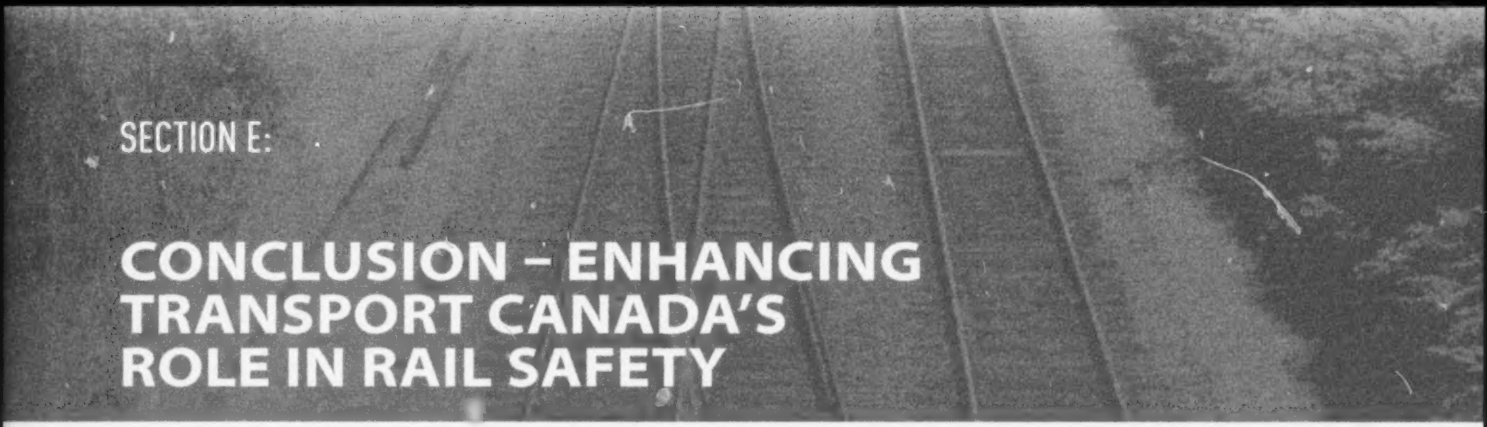
A. rail security and cyber security;

B. Transportation Appeal Tribunal of Canada decision deadlines;

C. notification of work near pipelines;

D. compliance agreements; and

E. mandatory *Railway Safety Act* reviews.



SECTION E:

CONCLUSION – ENHANCING TRANSPORT CANADA'S ROLE IN RAIL SAFETY

The previous chapters and recommendations represent the results of the research, consultations and analysis performed by the Review. The conclusion of this assessment was that while overall progress was substantial regarding oversight and compliance, there were a number of issues where progress had been limited over the past 10 years. Most of these persistent issues had two characteristics. First, addressing the issues successfully required changes in the role of Transport Canada to complement its rail safety oversight and compliance role. Second, responsibility for the issues involved a number of players, where no single organization had the authority or role to address them. For example many of these issues involved the need for more extensive collaboration with others, such as provinces/territories, Indigenous groups, municipalities, unions and railways.

The major areas identified where progress was slow or more progress was needed were the implementation of SMS as part of an overall risk management approach to rail safety; the need to embrace leadership or facilitator roles in technology, human and organizational performance, and safety culture; the continuing challenges of proximity issues; and finally, the need to address gaps in collaboration, community outreach, information and transparency.

Three Questions

There are three dominant questions that emerged from this Review:

1. Is the *Railway Safety Act* sound, or does it need major changes to ensure rail safety?
2. Is the rail system in Canada getting safer?
3. Is the rail safety regime in place in 2018 sufficient to drive improvements for the next decade or more, or are there changes required to the role of Transport Canada, as well as the approach to safety?

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1. Does the *Railway Safety Act* require major changes?

The Review is convinced that the overall structure and provisions of the Act are sound, especially with the changes following the 2007 RSA Review and new requirements implemented in the wake of the tragic Lac-Mégantic accident.

The consensus in submissions and roundtable sessions was that the *Railway Safety Act* did not need major changes. Except for the issue of the proximity of communities to rail operations and grade crossings, most suggestions were focused on specific issues of transparency, clarity or on dealing with some of the impacts of previous changes.

Transport Canada has done a good job of responding to the safety challenges related to rail operations. The past five years have seen the most active and significant changes in Canada's rail safety regime in decades. These changes have resulted in modifications to the Act, new regulations to deal with safety management systems, rail crossings, the transportation of dangerous goods and a significant expansion of the Rail Safety Program staff and inspections. For example, the number of qualified inspectors increased from 102 in 2013/14 to 141 as of November 2017, a 38 per cent increase.

The Review did not identify the need for significant changes to oversight and compliance at this time. The main focus should be on continuing to implement and enforce the current legislation, regulations and rules; enhancing risk assessment processes; improving the interface of inspections with safety management systems; and addressing some issues or consequences of previous changes that have emerged.

2. Is the rail system getting safer?

The operation of the rail system is getting safer, as illustrated in Section B of this Report, which outlines the significant and continuing reduction in overall major accidents, such as derailments on main lines.

This is the result of a combination of factors including substantial investments in infrastructure, especially by Class 1 railway companies; some advances in rail inspection technology by both the railway industry and the Department; impressive deployment of scanning and monitoring technology by railways; and progress in oversight and risk management by Transport Canada and railways.

The main exception to this trend is the high number of deaths and serious injuries related to rail grade crossings and trespassing. Addressing this issue requires increased investments and a focus on contributing factors beyond the crossings themselves and improved coordination and collaboration among a number of partners. Also, as infrastructure and equipment-related incidents decline, human and organizational performance matters are becoming an increasing factor in a proportion of incidents.

In the aftermath of the tragic Lac-Mégantic accident, the primary preoccupation of the Department has, understandably, been strengthening oversight and compliance, implementing SMS and dealing with the many ongoing operational issues related to rail safety. These changes have consumed much of the available resources and expertise of the Rail Safety Program. The result is improved safety, and some progress in establishing the basic requirements for SMS with railways.

The downside of these successes is that the current approach to rail safety, which is primarily focused on regulations, inspections and compliance related to infrastructure and operations, is trending toward its limits in terms of safety improvements. This approach has major limitations in dealing with persistent issues and meeting the challenges and opportunities for safety improvement in the future.

3. Is the rail safety regime of 2018 sufficient to address persistent issues and the challenges of the future?

The short answer is – No. The Review has concluded that the major challenge now faced by the Canadian rail safety regime is building the capacity to help address persistent issues (e.g., accidents at rail crossings and due to trespassing) and to respond to the reality that rail safety issues are shifting from an operational/infrastructure-based nature to human and organizational performance-based issues.

Transport Canada has to make a strategic change in its role and capacity, beyond its traditional railway compliance and enforcement functions, to effectively address these persistent issues, take advantage of opportunities in areas such as technology and to respond to the human and organizational performance safety challenges of the future. The Review has used the word "strategic" purposely, because it means a significant shift in the overall approach to safety and the functions of the organization to accomplish this change.

While there has been an increased focus on SMS since 2015, the dominant focus in the past five years has been on oversight and inspections related to the physical operation of railways. This compliance focus is extremely important to a robust oversight role, but not sufficient to maintain an effective rail safety regime that takes full advantage of the safety improvement challenges and opportunities of the future.

Building a Rail Safety Regime for the Future

Our consultations with stakeholders, the Department and safety experts clearly illustrated that dramatic changes will occur in the overall transportation field, including railways, in the next 10 years.[279] Rail transportation will have to adjust to major changes in the economy and business practices, and new technologies will become available that can significantly improve rail operations, inspection practices and rail safety.

These technologies will dramatically change the capacity of railways and the Department to assess rail safety issues and develop predictive indicators to identify safety actions. This will inevitably change the roles of employees in railways, as well as in the Department. The workforce of railways is changing rapidly, which creates challenges for training, but also opportunities for new approaches to safety, including safety culture initiatives. Finally, it is clear from the experience of leading safety critical sectors that the most significant safety challenge in the future is how to improve human and organizational performance by engaging employees in identifying risks and continuous learning to maximize safety performance.

Transport Canada is at the crossroads in its approach to rail safety. One path is to continue with the extensive initiatives and dominant focus to strengthen regulation and compliance and implementation of safety management systems that have been taken in the last decade. The second path is to build on the work that has been done to strengthen regulation and compliance, but also recognize that to take the next step in enhancing safety, the Department needs to evolve its role to be able to tackle persistent issues and the challenges and opportunities for rail safety in the future.

The assessment of this Review is that the current safety regime has produced important improvements in rail safety, but that it cannot meet the challenges of dealing with persistent issues or the requirements for an effective safety regime in the future.

Five Key Changes for the Rail Safety Regime

There are five major areas that the Department needs to address to respond to remaining gaps in the rail safety regime and to be effective in addressing the challenges of the future. Section C of this Report provides recommendations on all of these areas.

The recommended changes all require a shift in the role of Transport Canada from an overwhelming focus on the role of "the regulator" (e.g., regulations, inspections and compliance related to infrastructure and operations), to one of regulator plus "leader and enabler" (e.g., promotion, facilitation, learning and support). Many of the "persistent" issues involve shared responsibility, particularly those related to land use planning, grade crossings and trespassing. This requires significant leadership in bringing governments, railways and others together to address these issues.

The five key directions required as part of this strategic change to the role of Transport Canada are:

1. **Building a More Effective Rail Safety Regime.** The Department needs to commit to a rail safety regime that includes and integrates all three dimensions of safety (i.e., technical standards and compliance, safety management systems, and safety culture); define its role in all three areas; build capacity for the promotion of safety culture; and develop an action plan for achieving these three critical elements of a rail safety regime.
2. **Enhancing Capacity to Address Human and Organizational Performance Issues.** Recognizing that human factors are contributing to an increasing proportion of accidents, Transport Canada, in collaboration with railway companies, needs to develop increased expertise on human and organizational factors and how they affect safety performance. A good example of this is the current initiative by Transport Canada on fatigue management.

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[279] **Transport Canada.** Transportation 2030: A Strategic Plan for the Future of Transportation in Canada. **Website.**

3. **Providing Leadership on Technological Change.** In the next 10 years the potential for technological change driven by advances in communication and information technology has the potential to dramatically change the capacity of railways and the Department to monitor rail infrastructure, and anticipate and address safety issues. Transport Canada must be an active player as a leader and facilitator of rail safety technologies, and ensure it has the appropriately skilled staff and capacity to take full advantage of these technologies.

4. **Providing Leadership and Direction on Crossings, Trespassing and Proximity Issues.** Transport Canada should clarify the role of the federal government with respect to land use issues that compromise rail safety and develop the necessary regulations to ensure compatible uses and the safe development of land near rail operations. In addition, Transport Canada needs to enhance funding to address the major safety risks of grade crossings and develop a national program to address rail trespassing issues.

5. **Improving Governance, Collaboration and Public Trust.** Transport Canada must expand its partnership role and community outreach to strengthen the cooperation of the key players that affect rail safety. It must engage provinces/territories and municipalities more actively in addressing areas of shared responsibility. To enhance public trust, Transport Canada must dramatically improve platforms for communications with the public, so that individuals and communities understand the rail safety regime and can engage in addressing key safety issues.

Transforming the Role of Transport Canada: The Path Forward

The recommendations of this Review focus on major changes in how stakeholders collaborate to improve rail safety, and on the required changes to the role of the Department. These are fundamental and very difficult changes to effect, even if absolutely necessary. Therefore, it must be understood that these recommendations are not "quick fixes" that can be achieved in a short period of time.

The Department will need to establish a clear direction and strategic transition plan to undertake these changes and then take the necessary actions to implement these changes in partnership with other players. By making a strategic change in its role, the Department will be able to address the persistent issues where progress has been limited, and continue to ensure that the rail safety regime is able to adapt and respond effectively to the safety challenges that Canada and Canadians will face in the near future.

Recommendation 16 – It is recommended that in order to maintain and develop a rail safety regime that meets the challenges of today and the future, Transport Canada's Rail Safety Program undergo a significant strategic transformation in role and safety approach. This change should maintain the current strengths of the Department in regulation, inspection and enforcement while transforming its role and capacity to:

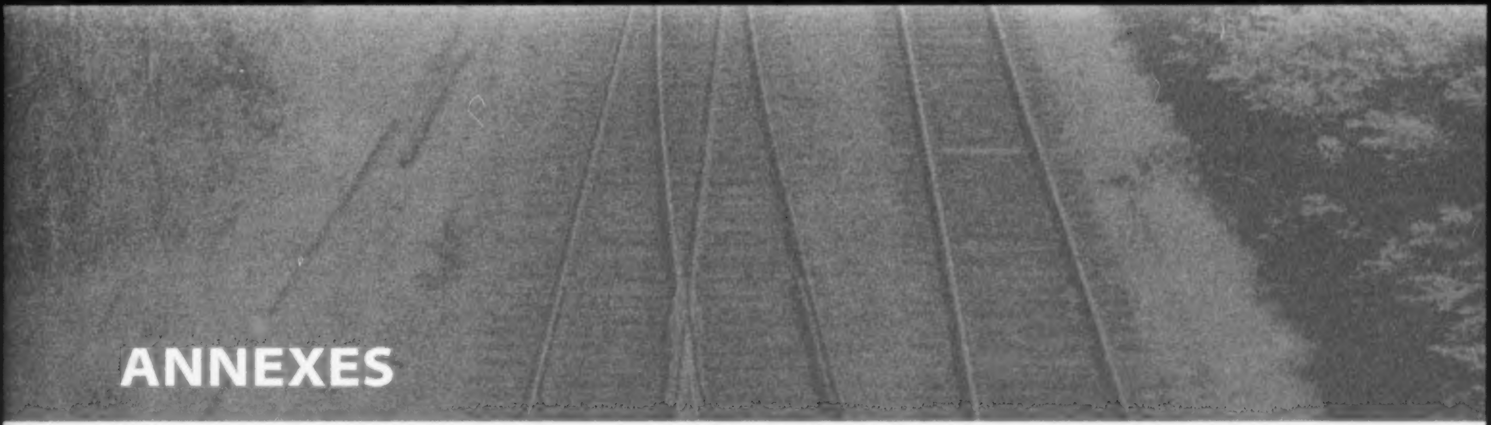
A. improve the implementation of SMS and promote safety culture;

B. enhance capacity of Transport Canada to address human and organizational performance issues that are critical to safety;

C. provide leadership and flexibility on safety enhancing technological innovations;

D. increase leadership and direction to address crossing and trespassing issues and safe and compatible land development in proximity to railways; and

E. improve collaboration among governments to address safety issues and develop improved communications platforms for community assurance and outreach.



ANNEXES

ANNEX A – LIST OF RECOMMENDATIONS

Recommendation 1 - To strengthen SMS to ensure a greater focus on effectiveness and safety outcomes, it is recommended that:

A. Transport Canada continue initiatives to train and build internal capacity to audit and assess the effectiveness of a railway company's SMS, in addition to ensuring that the SMS meets the requirements of the regulations.

B. SMS audit reports identify weaknesses and strengths of railway company safety management systems and provide direction for improvements, as well as best practices for continuous learning. Results of audits should help companies identify areas for improvement that allow them to address the root causes of safety issues, rather than simply fixing technical non-compliances with the SMS Regulations.

C. Transport Canada transition from "system-in-place" audits to an integrated approach that focuses on key risk areas (e.g., signals, yards, bridges) and combines the expertise of specialized inspectors with trained railway systems auditors. This will improve the integration of a systems-based approach with the expertise of inspectors, which can help link processes and systems to safety results.

Recommendation 2 – Recognizing that safety culture is a key component of a safe rail system and that safety culture improvements must be driven by railway companies with active promotion and support by Transport Canada, it is recommended that:

A. Railway companies develop and formally adopt safety culture policy directions and plans, including an approach to safety culture assessments, improvements and information sharing.

B. Transport Canada develop a safety culture policy statement that provides clear support for the fundamentals of safety culture as part of the rail safety regime, and supporting guidance on the relationship between safety culture, SMS and technical compliance and the regulator's role with respect to each of these elements.

C. Transport Canada develop internal capacity on safety culture, human factors, and behavioural and social sciences within its Rail Safety Program, and actively support the ongoing exchange of best practices and continuous learning within the railway industry.

D. Transport Canada, in partnership with industry and others, provide core funding to support initiatives such as safety culture assessments by short line railway companies, and academic institutions that promote continuous learning to further strengthen safety culture in the railway industry.

Recommendation 3 – It is recommended that Transport Canada assume a leadership role on fatigue in the rail sector in order to set a flexible way forward that is in place in a timely fashion and includes:

A. working with employee representatives (unions), industry, and fatigue science specialists to develop a national approach to fatigue in the rail sector, including sustained collaboration between unions and industry; and

B. regulating prescriptive minimum criteria (that reduce the current number of on-duty hours and provide increased opportunities for rest) and non-prescriptive measures based on evolving fatigue science.

Recommendation 4 – To capitalize on the potential for safety improvements that can be derived from technology and innovation in the rail sector, it is recommended that Transport Canada facilitate the development and adoption of rail safety technology by:

A. strengthening its capacity in the areas of technology evaluation and data analytics in the rail sector, including the proactive use of data analysis;

B. articulating a strategic outlook, research direction and objectives that would be used to evaluate existing and new technologies that enhance rail safety and provide predictability to industry to make investments in innovation;

C. leveraging relationships with research-oriented organizations to target research on human performance and inspection quality; and

D. ensuring exemptions granted for testing purposes under Section 22.1 of the Railway Safety Act include provisions for the testing data collected to be provided to Transport Canada for the purposes of regulatory development or additional research.

Recommendation 5 – It is recommended that Transport Canada, in partnership with industry, develop a Canadian approach to enhanced train control (ETC) technologies and establish a technology road map for implementing ETC in a staged and cost-effective manner.

Recommendation 6 – It is recommended that Transport Canada develop a comprehensive national initiative to improve grade crossing safety, in partnership with other levels of government, the railway industry and other key stakeholders. This initiative should aim to establish and prioritize crossing programming on a risk basis, taking into account safety, railway corridor efficiency and crossing use. It should build on existing efforts and include:

A. providing increased and ongoing funding for the Rail Safety Improvement Program;

B. formalizing and publishing criteria that specify when grade separations should be considered instead of grade crossings;

C. prioritizing grade separation projects and grade crossing closures in all major infrastructure programs, to enhance public safety and strengthen trade corridors;

D. pursuing technological solutions to reduce motor vehicle/pedestrian and train collisions; and

E. taking measures to limit the number of new grade crossings, notably by examining the legal framework that currently governs their construction.

Recommendation 7 – As human behaviour remains a persistent causal factor in rail-related deaths and serious injuries due to trespassing and grade crossing accidents, it is recommended that the federal government, in collaboration with other levels of government, the railway industry, academia and communities develop a national strategy to reduce the number of fatalities and injuries that result from trespassing on railway property. This strategy should comprise a number of components, including:

A. a trespassing prevention program to create safer communities by promoting the development of long-term trespassing prevention measures through community-based partnerships. This includes sufficient and sustainable support for education and awareness programs, such as Operation Lifesaver Canada, to help them continue their activities in promoting rail safety among target groups;

B. funding for research projects at universities and research centres to tackle trespassing and suicide issues; and

C. linking to other initiatives, such as the Federal Framework for Suicide Prevention to work with other stakeholders to develop railway suicide prevention/intervention strategies that are evidence-based and supported by research.

Recommendation 8 – It is recommended that the federal government provide leadership in addressing incompatible land use around rail operations by driving a substantive dialogue between all jurisdictions and stakeholders, with a view to developing a solution to land use near rail operations on a national scale. Measures to this effect should include:

A. launching a senior government-level dialogue with the provincial/territorial governments to promote the formal adoption of measures equivalent to the "Guidelines for New Development in Proximity to Railway Operations," developed jointly by the Federation of Canadian Municipalities and the Railway Association of Canada, in land use planning policies that apply to municipalities;

B. amendments to Part III (Non-Railway Operations Affecting Railway Safety) of the Railway Safety Act be made to provide the Governor in Council with the authority to make regulations requiring land use planning authorities to provide pre-notice to affected railway companies before authorizing land use or zoning changes, as well as construction within a prescribed distance (e.g., 300 metres) of a railway corridor; and

C. amendments to Part III (Non-Railway Operations Affecting Railway Safety) of the Railway Safety Act to provide the Governor in Council with the authority to make regulations that define safety criteria for construction and activity within a prescribed distance (e.g., 30 metres) of a railway operation. Regulations should be developed in consultation with relevant provinces/territories, Indigenous groups, municipalities, railways, associations, and citizen groups.

Recommendation 9 – Recognizing that rail safety issues, including governance and proximity, are a shared responsibility and require extensive collaboration among governments as well as railways, it is recommended that:

A. there be an ongoing institutional ministerial-level mechanism (with appropriate working-level support) to identify, address and resolve rail safety issues (e.g., Council of Ministers Responsible for Transportation and Highway Safety and government departments responsible for land use planning); and

B. Transport Canada work with the provinces/territories to establish or update rail safety Memoranda of Agreement in order to ensure greater clarity and consistency in rail safety regimes across jurisdictions.

Recommendation 10 – It is recommended that the *Railway Safety Act* be amended to allow local railway companies to request exemptions from elements of the SMS regulations where SMS requirements would have limited safety benefits for their operations. The exemptions should be risk-based, time-limited and require local railway companies to notify the Minister if there are any changes to the operations or class of goods being carried by a company with an existing exemption.

Recommendation 11 – In recognition of the vital role of short line railways in Canada's national transportation system, and the challenges they have in funding safety-related infrastructure improvements, it is recommended that:

A. funding under the Rail Safety Improvement Program allocate a portion specifically for grade crossings involving railways other than Class 1 railways; and

B. the Government provide additional financial support programs for short line infrastructure investment to improve safety.

Recommendation 12 – In order to provide additional transparency around the rule-making process, it is recommended that:

A. Transport Canada develop a policy that articulates in which cases regulations will be considered instead of rules and that all stakeholders be informed of these criteria;

B. the Railway Safety Act be amended to allow the Minister to seek advice from, or consult with, any relevant party in relation to a proposed rule; and

C. Transport Canada, in consultation with the railway industry, update the existing "Guideline on Submitting a Proposed Rule or a Revision to a Rule under the Railway Safety Act" to:

- **ensure that relevant associations and organizations and Transport Canada are involved earlier in the development and drafting of proposed rules; and**
- **ensure the railway includes all comments received, along with the railway's response to each.**

Recommendation 13 – It is recommended that Transport Canada, the Railway Association of Canada and railway companies work together to update rules or provide interpretation guidance for rules and regulations, as necessary, in order to:

A. ensure that rules are relevant, clear, consistent and enforceable;

B. account for operational differences between Class 1 railways, local/short line railways or commuter railways; and

C. provide the flexibility to allow technological innovation, where applicable.

These principles should also be considered when submitting new rules and should be reflected in the Guideline.

Recommendation 14 – To uphold the principles of openness and transparency, engage in more meaningful dialogue with Canadians and help build public trust in the rail safety regime, it is recommended that Transport Canada, with the help of railways where needed, expand its engagement activities by:

A. publishing information on Transport Canada's oversight activities and railway remedial activities alongside the enforcement actions already available online;

B. developing and maintaining a publicly accessible interactive map tool that can provide information about the railway system including rail lines and owners, grade crossing locations and details, and accident/incident information;

C. modifying the departmental website to transform it into a more effective tool to inform the public and communities; and

D. building capacity for community and municipal outreach and public engagement activities on rail safety matters within Transport Canada.

Recommendation 15 – To clarify requirements in the *Railway Safety Act*, address jurisdictional gaps, and improve the Act's flexibility and efficiency, it is recommended that Transport Canada address issues within the Act and supporting instruments, in the noted areas of:

A. rail security and cyber security;

B. Transportation Appeal Tribunal of Canada decision deadlines;

C. notification of work near pipelines;

D. compliance agreements; and

E. mandatory Railway Safety Act reviews.

Recommendation 16 – It is recommended that in order to maintain and develop a rail safety regime that meets the challenges of today and the future, Transport Canada's Rail Safety Program undergo a significant strategic transformation in role and safety approach. This change should maintain the current strengths of the Department in regulation, inspection and enforcement while transforming its role and capacity to:

A. improve the implementation of SMS and promote safety culture;

B. enhance capacity of Transport Canada to address human and organizational performance issues that are critical to safety;

C. provide leadership and flexibility on safety enhancing technological innovations;

D. increase leadership and direction to address crossing and trespassing issues and safe and compatible land development in proximity to railways; and

E. improve collaboration among governments to address safety issues and develop n improved communications platforms for community assurance and outreach.

ANNEX B – TERMS OF REFERENCE OF THE REVIEW[280]

Context

Following the tragic railway accident in Lac-Mégantic, Québec on July 6, 2013, the Government of Canada embarked on a series of immediate actions to further strengthen the federal regimes for rail safety and for the transportation of dangerous goods by rail. This included the issuing of Emergency Directives to immediately address initial safety risks stemming from the accident, as well as the accelerated development of a series of new rules and regulations, and legislative amendments to the *Railway Safety Act*, to address subsequent recommendations and lessons learned from that tragic event.

Today, four years later, strengthened rail safety continues to be a priority for Canadians beyond direct links with the Lac-Mégantic accident, with heightened interest in the interface between municipalities and the railways, the increasing volumes and demands of the rail transportation network, and the often rapid pace of innovation and technological change. A strengthened regime also continues to be a priority for the Government of Canada as outlined in the mandate letter of the Minister of Transport which directs, as a top priority, to, "propose measures to reinforce rail safety." As the *Railway Safety Act* is the primary legislation for the safety of the railway transportation network, the review of its authorities, governance, and operation will help address not only issues raised by Canadians, but by rail stakeholders themselves, to further strengthen rail safety in Canada.

Mandate

The mandate of this Review stems from section 51 of the *Railway Safety Act* which requires the Minister of Transport to appoint one or more persons to carry out a comprehensive review of the operations of the Act no later than five years after that section came into force, which would be May 1, 2018. As part of *Transportation 2030 – A Strategic Plan for the Future of Transportation in Canada*, however, the Minister of Transport has accelerated the launch of the Review to April 1, 2017 to evaluate more promptly the current state of rail safety in Canada.

The Review of the Act will include the entirety of its existing provisions, as well as the suitability, sufficiency, and efficacy of the regulatory framework and programs that exist under its authority, and the degree to which the Act meets its core objective of ensuring rail safety, in the best interests of Canada and Canadians.

The Review process

A Review Panel consisting of one chair and two panel members will be appointed by the Minister of Transport and will conduct an independent study and analysis, undertake consultations, and prepare a report with findings and recommendations to be submitted to the Minister of Transport on or before May 1, 2018.

The Panel, supported by a secretariat staff, will consult a wide range of stakeholders, including the public, railway companies and their industry associations, railway company employees and their unions, railway customers (e.g., travellers and shippers), provinces and territories, municipalities, aboriginal and environmental groups, as well as Transport Canada and other federal government departments and agencies.

These consultations will occur across Canada, to ensure individuals and groups can present their views, as well as on-line, in order to accommodate input from all interested parties regardless of location. To assist those who wish to make a submission, the Panel will prepare a Guidance Document setting out key issues of interest and make it available online and in both official languages.

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[280] As at April 27, 2017.

Scope of the Review

The final report from the Panel will include findings and any recommendations to improve rail safety, drawn from the information collected through review of the existing regulatory framework and programs as well as through consultations. The recommendations may include possible amendments to the *Railway Safety Act*.

In conducting its review and analysis, the Panel will assess the suitability, sufficiency, and efficacy of the *Railway Safety Act* and its framework of Rules, regulations and programs. Specifically, the Panel will look at lessons learned from implementing comprehensive amendments that came into force in May 2013 and in June 2015, as well as the authorities and operation of the Act which were highlighted in the wake of the tragic Lac-Mégantic accident. Among other things, the Panel will be asked to consider the following specific issues:

- Whether adjustments to oversight authorities are needed to continue to achieve the high standards for safe rail transportation;
- Whether regulatory authorities can better address emerging risks, changes in technology and innovation;
- Whether the delivery of regulatory and oversight regimes could be made more efficient;
- How collaboration between companies and communities respecting rail safety can be supported;
- Whether current funding mechanisms are sufficient to support safety enhancements to the rail transportation system; and
- Whether the current security authorities in the *Railway Safety Act* are sufficient to address concerns and emerging issues related to the security of the rail transportation system.

Panel roles and responsibilities

The Review will be conducted at arm's length from the Government of Canada. The Review Panel will be headed by a Chair, who will have sole responsibility and discretion with respect to the Report's contents, including its findings and recommendations. Two Vice-Chairs will support the Chair in leading the review, and will ensure a broad range of expertise is available in conducting the review.

Secretariat roles and responsibilities

The Review Panel will be supported by a dedicated Secretariat assigned to support the Panel in planning, executing, and reporting on the review. The Secretariat will consist of nine full-time employees.

The Secretariat will provide support to the Panel in conducting the review, including providing advice to the Chair and other panel members on key issues as required.

Under the Panel's guidance, the Secretariat will develop and manage the overall project work plan to ensure all timelines are met and products are delivered to complete the review.

This work will include, among other duties:

- outlining all departments, provincial and territorial governments, rail companies as well as other agencies and stakeholders that secretariat will work with to address horizontal issues;
- developing, for the Panel's approval, a plan for analyzing key subjects and emerging trends in the railway industry, including challenges or obstacles;
- assisting in the planning and implementation of in-person and on-line consultations and engagement with Canadians, rail safety stakeholders, provinces and territories and Indigenous groups;
- managing communications associated with the Review;

- identifying potential operational priorities that should be examined in the short, medium and long-term;
- identifying potential vulnerabilities, threats and risks in complex rail transportation environments;
- reviewing and analyzing stakeholder submissions from in-person and on-line consultations;
- assisting in formulating recommendations as part of a final report to the Minster for his reference; and finally,
- supporting and addressing any follow-up that may arise immediately after the submission and public publication of the final report.

Key deliverable and timeline

The Panel will be appointed in May 2017 and will be required to submit one final report, which will be submitted to the Minister of Transport on or before May 1, 2018.

Official languages

The final report and any other documents produced by the Panel for public dissemination will be produced and made publicly available in English and French.

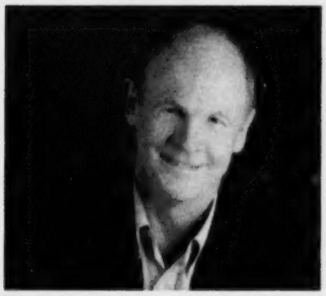
Confidentiality

All information gathered by the Panel in the course of its work is subject to the provisions of the *Access to Information Act* and the *Privacy Act*.

ANNEX C – BIOGRAPHIES OF REVIEW PANEL MEMBERS

Chair:

Richard Paton MA, MPA



Richard Paton was President of the Chemistry Industry Association of Canada from 1996-2015, an association which is a global leader in Responsible Care and deeply committed to all aspects of safety in its operations, including transportation.

In his 24 year career in the federal government, Richard was a senior executive in several departments. He was an executive at the Office of the Auditor General from 1981-1986 where he led comprehensive audits of two departments. He was Assistant Secretary and Deputy Secretary of the Treasury Board 1988-1996.

As Deputy Secretary of the Program Branch at Treasury Board, he led a very large staff which were responsible for reviewing and allocating resources to all departments, agencies and crown corporations. He led the historic Program Reviews for Treasury Board in 1995 and 1996 that resulted in a balanced federal budget. He was also responsible for leading the groups responsible for the innovation of government policies in a range of areas including regulatory affairs, procurement, alternative service delivery, information technology, and real property.

Richard is currently an Adjunct Professor in the Masters in Public Policy and Administration program at Carleton University. He teaches two courses- one on the management of public organizations and the other in leading non-profits and associations. These courses are based on the three textbooks that Richard published between 2013 and 2015.

Richard has a Masters in Canadian Studies from Carleton University (1975), and a Master's in Public Administration from Harvard University (1981).

Vice Chair:

Brenda Eaton

Brenda Eaton is an experienced corporate director, serving on the Boards of a number of private, public, not-for-profit and crown corporation Boards. She currently sits on the Boards of Fortis BC, Westland Insurance, BC Safety Authority, Transelec and Victoria's Core Area Wastewater Treatment Project Board. For seven years Ms. Eaton was Chair of BC Housing, and she has also served on the Boards of BC Hydro and Translink. In 2016, she was a member of British Columbia's Judicial Compensation Commission.

Prior to becoming a corporate director Ms. Eaton was a senior leader in the BC Government. From 2001-2005 she was Deputy Minister to Premier Gordon Campbell. Prior to that she held executive positions in the BC Government, including Deputy Minister of Finance and Treasury Board; Energy and Mines; and Social Services. For several years she was Chief Financial Officer of a Health Authority.

Ms. Eaton has also been active in the non-profit sector. She currently serves on the Boards of the Canadian Institute for Advanced Research, the Max Bell Foundation and the BC Alzheimer's Society.

Ms. Eaton is certified by the Institute of Corporate Directors (ICD.D) and has received several recognition awards including the Queen's Jubilee Award for community contribution, University of Victoria's Distinguished Alumni and WXN's 100 Most Powerful Women in Canada.

Ms. Eaton has a Master's Degree in Economics.

Vice Chair

Pauline Quinlan

First woman to be elected in Bromont in November 1998, Pauline Quinlan has served five consecutive mandates, giving her nearly 20 years of experience in politics. She sat on the Board of Directors of the Federation of Canadian Municipalities, where she served as Co-Chair of the Rail Safety Committee following the tragedy of Lac-Mégantic, and Chair of the Standing Committee on Environment and Sustainable Development since 2015.

She was also Chair of the Quebec Caucus from 2011 to 2015. She is fluent in both official languages in Canada and was called upon to act as FCM's spokesperson on a variety of issues across Canada. Mrs. Quinlan also works within the Union des municipalités du Québec as a member of the Training Committee and a member of the Commission for Planning and Transportation.

At the local level, Mrs. Quinlan has enabled the City of Bromont to adopt a sustainable development plan for the next twenty years. During these five terms, she was the instigator for the creation of the Bromont Economic Development Corporation, of which she is the president. This contributed to the recognition of the Bromont Science Park, which enabled the implementation of the microelectronics research center in partnership with the University of Sherbrooke, the provincial government, the federal government and IBM and Teledyne-Dalsa. She also chairs the Local Development Center of the Regional County Municipality of Brome Missisquoi since 2011.

In 2011, she was the recipient of the Marcelle B.-Trépanier Tribute Award from the Réseau des élues municipales de la Montérégie Est. She also received the Queen's Diamond Jubilee Medal in 2013.

Prior to her political career, Pauline Quinlan graduated from the University of Sherbrooke where she obtained her degree in Education and worked in the field for 35 years as a teacher, counselor and principal.

ANNEX D – *RAILWAY SAFETY ACT* REVIEW SECRETARIAT

To achieve a significant one-year review by a three-person Panel required a combination of leadership and teamwork of the Panel and an enormous contribution by a professional and dedicated Secretariat.

The background expertise and experience that Panel members, Brenda Eaton and Pauline Quinlan brought to the Review were highly complementary and ensured that a diverse range of perspectives and lenses were applied to our examination of rail safety in Canada. These combined skills and the working relationships we developed with each other and with the Secretariat allowed this Review to function smoothly and effectively over the period of April 27, 2017 to May 1, 2018.

The Panel was very fortunate to have an excellent team that combined all the complementary skills needed for this Review. The Secretariat, working very cooperatively with the Panel, made it possible to do the necessary research, organize and record our consultations, communicate and engage stakeholders and the Department, and contribute to the drafting of the Report based on the overall direction of the Panel on its objectives, priorities and recommendations.

The names of the Secretariat members are listed below, including their specific titles. However, in a Review of this nature, the Secretariat staff had to take on whatever assignments were necessary based on the issues that emerged, carry out a variety of roles based on the needs of the Review, and be able to adapt and adjust to shifting directions of the Report, as our understanding of the issues deepened throughout this process. The teamwork in achieving this was ideal.

On behalf of the Panel, I want to give a special thanks to the dedication, professionalism and teamwork of the Secretariat and their contribution to making this Report possible.

Richard Paton

Richard Paton, Chair
Railway Safety Act Review

***Railway Safety Act* Review Secretariat:**

Fabien Lefebvre, Director

Luciano Martin, Senior Technical Advisor

Nadine Foster, Senior Advisor

Steve Palisek, Senior Advisor

Abdelali Abdessadek, Senior Analyst

Audrey Beecraft, Analyst

Heather Parsons, Analyst

Karole Bourgon, Program Manager

Nadine Benoit, Finance and Administration Coordinator

ANNEX E – LIST OF COMMISSIONED REPORTS

1. **Assessing the State of Railway Safety in Canada**
   CPCS (November 2017)

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2. **Impact of Cyber Security Threats on Rail Safety**
   Critical Systems Labs (December 2017)

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3. **Railway Safety in Canada – The Role and Value-Adding Model of Transport Canada/ Rail Safety in Technology-Based Innovation**
   John Coleman, Senior Fellow, School of Public Policy and Administration,
   Carleton University (December 2017)

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4. **International Benchmarking in Rail Safety Governance**
   Laurie Mitchell (January 2018)

ANNEX F – KEY MEETINGS AND EVENTS

May 2017

May 11	Ottawa	› RAC Rail-Government Interface › Tim Meisner, Former Executive Director, Secretariat, RSA Review
May 23	Ottawa	› Office of the Auditor General of Canada
May 25	Ottawa	› Luc Bourdon, Former Director General, Rail Safety Directorate, Transport Canada
May 26	Ottawa	› Railway Association of Canada Board Meeting

June 2017

June 1	Ottawa	› Federation of Canadian Municipalities, Rail Safety Working Group
June 2	Montreal	› 9th International Level Crossing Awareness Day (ILCAD)
June 6	Ottawa	› Transport Canada Rail Safety Directorate › Transportation Safety Board of Canada › J. Patenaude › Transport Canada Fit to Fly Workshop, Gatineau
June 7	Ottawa	› Labour Canada › Federation of Canadian Municipalities › Teamsters / Unifor › Transport Canada Fit to Fly Workshop, Gatineau
June 15	Ottawa	› The Honourable Marc Garneau, Minister of Transport
June 19	Ottawa	› VIA Rail
June 26	Pueblo, Colorado	› Transportation Technology Center Inc.
June 28-29	Winnipeg	› CN Training Centre › Transport Canada Regional Managers and Inspectors › CANDO Rail Services

July 2017

July 27	Montreal	› Transport Canada Regional Managers and Inspectors › CN Taschereau Railyard
July 28	Bromont	› Ryan Ratledge, Central Maine and Quebec Railways › Interim and former mayors of Lac-Mégantic

August 2017

August 30-31	Ottawa	› Railway Operations Live – Railway Association of Canada

September 2017

Sept. 6	Ottawa	› Operation Lifesaver Canada › Transport Canada, Assistant Deputy Minister, Safety and Security › Federation of Canadian Municipalities
Sept. 14	Ottawa	› Federation of Canadian Municipalities/Railway Association of Canada Proximity Initiative › Railway Association of Canada › Canadian Pacific (CP) › The Honourable Marc Garneau, Minister of Transport
Sept. 18	Montréal	› Regional Roundtable › Thematic Roundtable (Theme – Proximity)

October 2017

Oct. 4	Ottawa	› Railway Association of Canada / Transport Canada, Safety Management Systems Workshop
Oct. 5	Ottawa	› CANDO Rail Services
Oct. 11-12	Halifax	› Safety Culture Summit
Oct. 13	Dartmouth	› Regional Roundtable › Thematic Roundtable (Theme – Fatigue Management and Fitness for Duty)
Oct.18	Ottawa	› Chemistry Industry Association of Canada Board Meeting
Oct. 19	Vancouver	› Site Visit: CP Operations, Port Metro Vancouver, Delta Port, Coquitlam Rail Yard
Oct. 20	Vancouver	› Regional Roundtable › Thematic Roundtable (Theme –Infrastructure)
Oct. 22-27	Hong Kong	› 27th International Rail Safety Council Conference
Oct. 24	Ottawa	› Association of American Railroads
Oct. 24-25	Cornwall	› Transport Canada All Inspectors Meeting › Transport Canada All Inspectors Boot Camp
Oct. 31	Calgary	› CP Headquarters

November 2017

Nov. 1	Calgary	› Regional Roundtable › Thematic Roundtable (Theme – Technology)
Nov. 8	Toronto	› Regional Roundtable › Thematic Roundtable (Theme – Safety Management Systems and Rules)
Nov. 9	Toronto	› Transport Canada, Ontario Region Office Staff › Metrolinx

Nov. 13-14	Washington	› National Transportation Safety Board › Federal Railroad Association › Government Accountability Office
Nov. 17	Ottawa	› American Short Line and Regional Railroad Association
Nov. 20	Ottawa	› Federation of Canadian Municipalities Municipal Rail Safety Working Group
Nov. 22	Montreal	› Colloque ferroviaire 2017, AQTr – Le rail dans nos villes
Nov. 27	Ottawa	› Railway Association of Canada

December 2017

Dec. 4	Ottawa	› Clinton Marquardt (Fatigue Management Specialist) › Transportation Safety Board of Canada
Dec. 8	Ottawa	› Canadian National (CN)
Dec. 12	Ottawa	› Conference call with Provincial/Territorial governments
Dec. 18	Ottawa	› Office of the Auditor General of Canada

January 2018

Jan. 16	Ottawa	› Teamsters Canada Rail Conference
Jan. 22	Ottawa	› Genesee & Wyoming Inc. › Federation of Canadian Municipalities, Municipal Rail Safety Working Group
Jan. 29	Ottawa	› CN Officials

February 2018

Feb. 5	Ottawa	› CANDO Rail Services › Federation of Canadian Municipalities Representatives
Feb. 7	Ottawa	› CP Officials
Feb. 8	Ottawa	› Rail Safety First

March 2018

Mar. 5	Ottawa	› The Honourable Marc Garneau, Minister of Transport
Mar. 23	Lac-Mégantic	› Colloque sur la sécurité ferroviaire, Fédération québecoise des municipalités

ANNEX G – LIST OF STAKEHOLDER SUBMISSIONS

Alberta Association of Municipal Districts and Counties (AMMDC)
Association of Manitoba Municipalities (AMM)
Brian Mason, Minister, Alberta Government
B. Kozol
Canadian Association of Fire Chiefs (CAFC)
Canadian Common Ground Alliance
Canadian Gas Association (CGA) and Canadian Energy Pipeline Association (CEPA)
Canadian National Railway Company (CN)
Canadian National Railway Police Association (CNPRA)
Canadian Pacific Railway (CP)
CANDO Rail Services
Cape Breton Railway Victims Association, Michael MacNeil
Chemistry Industry Association of Canada (CIAC)
City of Ottawa
Coalition des citoyens et Organismes engagés pour la sécurité ferroviaire Lac-Mégantic
David Berard
Federally Regulated Employers – Transportation and Communications (FETCO)
Federation of Canadian Municipalities (FCM)
Federation of Canadian Municipalities (FCM) National Municipal Rail Safety Working Group (RSWG)
Federation of Canadian Municipalities (FCM) & Railway Association of Canada (RAC)
Fred Millar
Gabriel Ste-Marie, Member of Parliament
Government of New Brunswick
Government of Saskatchewan
Institut en Culture Sécurité Industrielle Mégantic (ICSIM)
International Association of Fire Fighters (IAFF)
Manitoba Infrastructure
Mark Winfield, York University
Metrolinx, Réseau de transport métropolitain & Translink
Ontario Ministry of Transportation
Operation Lifesaver
Rail Safety First
RailTek Systems Inc.
Railway Association of Canada (RAC)
Railway Association of Canada (RAC) & Canadian Urban Transit Association (CUTA)
Safe Rail Communities
Saskatchewan Association of Rural Municipalities (SARM)
SaskEnergy
Société pour vaincre la pollution, Daniel Green
Trains and Us/Nous et les trains
Teamsters Canada Rail Conference (Annex to CN Submission)
Unifor
Union des municipalités du Québec (UMQ)
Ville de Montréal
Waterloo Central Railway

ANNEX H – MEASURES TO ENHANCE RAIL SAFETY AND THE SAFE TRANSPORTATION OF DANGEROUS GOODS SINCE 2013

The following tables summarize the different actions that Transport Canada has undertaken to strengthen both rail safety and the transportation of dangerous goods in Canada since 2013. While not all of these measures have been undertaken under the authority of the *Railway Safety Act*, they are nonetheless all included below, to provide a complete picture of what has changed since 2013.

1. LEGISLATIVE CHANGES

Act	**Key Measure**	**Date**	**Objective**
Transportation of Dangerous Goods Act	DOT-111 Tank Car Standard	July 2, 2014	*The Transportation of Dangerous Goods Act* was amended to update the DOT-111 tank car standard, including thicker steel requirements and top fitting and head shield protection.
Amendments to the Railway Safety Act	The coming into force of the Safe and Accountable Rail Act.	Royal Assent: June 19 2015	The amendments to the *Railway Safety Act* further strengthened TC's oversight of federally-regulated railways across Canada by focusing on communities, accountability, safety management systems, and authorities. Specifically, the amendments to the *Railway Safety Act* broadened the powers of the Minister and inspectors to order railway companies and others to take specified measures or stop any activity in the interest of safe railway operations.
Amendments to the Canada Transportation Act	The coming into force of the Safe and Accountable Rail Act.	Royal Assent: June 19, 2015 Effective date: June 18, 2016	Liability and Compensation Regime - The Canada *Transportation Act* was amended to strengthen the liability and compensation regime for railways (e.g., risk-based minimum insurance levels and a supplementary shipper-financed compensation fund). Federally-regulated railways are required to carry a mandatory minimum level of insurance, based on the type and volume of dangerous goods they carry, ranging from $25 million to $1 billion.
Tabling of Transportation Modernization Act (Bill C-49)	Mandating Locomotive Voice and Video Recorder (LVVR)	May 16, 2017 (Tabling date)	Bill C-49 proposes to amend the *Railway Safety Act* to mandate the installation of LVVR in locomotive cabs to further enhance the safety of rail transportation in Canada.

2. REGULATORY CHANGES

Regulations	Date	Objective
Grade Crossings Regulations	December 17, 2014	The *Grade Crossings Regulations* establish comprehensive and enforceable safety standards for grade crossings; clarifying the roles and responsibilities of railway companies and road authorities; and requiring the sharing of key safety information between railway companies and road authorities.
Railway Administrative Monetary Penalties (AMPs) Regulations	April 1, 2015	The AMPs regulations introduce penalties as a new enforcement tool to help ensure compliance with the *Railway Safety Act* and its regime.
Railway Operating Certificates (ROC) Regulations	January 1, 2015	The *ROC regulations* dictate the baseline safety requirements that railway companies need to meet in order to operate on federally-regulated railway [tracks] in Canada.
Railway Safety Management Systems (SMS) Regulations	April 1, 2015	The SMS Regulations require a documented framework for integrating safety into day-to-day operations and allowing companies to identify risks and take early action. The new SMS Regulations apply not only to railway companies (federally-regulated companies) but also local railway companies (provincially-regulated railway companies) operating on federal track.
Transportation Information Regulations (TIRs)	April 1, 2015	The TIRs were amended to require data reporting from Class I and Class II rail carriers to better identify and address safety risks.
Transportation of Dangerous Goods Regulations	May 20, 2015	Amendments were made to the *Transportation of Dangerous Goods Regulations* to establish TC-117 tank car standards, the next generation of stronger, safer rail tank cars.
Prevention and Control of Fires on Line Works Regulations	Coming into force June 2017	These regulations enhance rail safety by reducing the likelihood of fires along railway lines which result from railway operations.

3. RAILWAY SAFETY RULE CHANGES

Rule	Date	Objective
Canadian Rail Operating Rules	December 26, 2013	Updated *Canadian Rail Operating Rules* that encompass more stringent operational safety requirements for railway companies.
Canadian Rail Operating Rules (i.e., Train Securement Rule, or Rule 112)	October 14, 2015	Amendments were made to the Canadian Rail Operating Rules to address final Transportation Safety Board recommendations pertaining to train securement.
Rule Respecting Key Routes and Key Trains	February 19, 2016	The requirements in the rule seek to reduce the risks and the consequences of rail accidents involving dangerous goods.

4. EMERGENCY DIRECTIVES

Date	Objective
July 23, 2013	An Emergency Directive was issued under the *Railway Safety Act* to require securing unattended locomotives and establish the number of crew members required for operating a locomotive carrying dangerous goods.
April 23, 2014	An Emergency Directive was issued under the *Railway Safety Act* to require railway companies to immediately implement key operating practices, including reducing the speed of trains transporting dangerous goods.
October 29, 2014	An Emergency Directive was issued under the *Railway Safety Act* to establish a standardized minimum for hand brake applications and specific testing requirements, and additional physical defenses for unattended trains.
April 23, 2015	An Emergency Directive was issued under the *Railway Safety Act* to slow trains transporting dangerous goods.

5. MINISTERIAL ORDERS

Date	Objective
July 23, 2013	Ministerial Order was issued requiring companies to formulate rules respecting unattended locomotives, prevention of uncontrolled movements and crew size requirements.
October 29, 2014	A Ministerial Order was issued under the *Railway Safety Act* to require railway companies to develop and enhance rules on train securement.
October 29, 2014	A Ministerial Order was issued under the *Railway Safety Act* requiring certain railways (including short lines) to submit training plans to Transport Canada for review.
August 17, 2015	A Ministerial Order was issued under the *Railway Safety Act* renewing requirements for all railway companies and local railway companies to formulate rules and, as the case may be, revise rules respecting the transportation of dangerous goods.

6. TRANSPORTATION OF DANGEROUS GOODS – PROTECTIVE DIRECTION

Protective Directive	Date	Objective
Protective Direction No. 31	October 17, 2013	Protective Direction No. 31 was issued under the *Transportation of Dangerous Goods Act* requiring any person who imports or offers for transport crude oil to retest, or classify, their crude oil prior to shipment, and, in the interim, ship it at the highest packing group level (PG1) until testing is completed.
Protective Direction No. 32	November 20, 2013	Protective Direction No. 32 was issued under the *Transportation of Dangerous Goods Act* requiring railway companies to share information with municipalities to support emergency planners and first responders.
Protective Directions No. 33 and 34	April 23, 2014	Protective Direction 33, requires emergency response assistance plans for five Class 3 flammable liquids: crude oil, gasoline, diesel, aviation fuel, and ethanol. Protective Direction 34, removes the least crash-resistant DOT-111 tank cars from dangerous goods service.
Protective Direction No. 36	April 28, 2016	Protective Direction No. 36 was issued under the *Transportation of Dangerous Goods Act to* replace Protective Direction No. 32. It requires railways to provide municipalities and first responders with even more dangerous goods information to improve emergency planning, risk assessments, and help train first responders. It also requires operators to provide jurisdictions with information that can be shared directly with the Canadian public.
Protective Direction No. 37	June 6, 2016	Protective Direction No. 37 was issued under the *Transportation of Dangerous Goods Act to r*equire top-fitting protection when TC/DOT-111 tank cars are retrofitted according to the retrofit schedule introduced in May 2015 regarding the TC-117 tank car standard. These requirements will enhance the safety of the transportation of flammable liquids including crude oil and ethanol in Canada, and will further align Canadian requirements with those for retrofitted TC/DOT-111 tank cars in the U.S.
Protective Direction No. 38	July 25, 2016	Protective Direction No.38 was issued under the *Transportation of Dangerous Goods Act* to accelerate the phasing out of DOT-111 tank cars for crude oil service to November 1, 2016. The accelerated timeline will phase out unjacketed legacy DOT-111 tank cars six months early and legacy jacketed DOT-111 cars 16 months early.

7. FUNDING

Fund	Date	Objective
Rail Safety Improvement Program	October 12, 2016	The Rail Safety Improvement Program provides grant and contribution funding to improve rail safety and reduce injuries and fatalities related to rail transportation in the areas of infrastructure, technology, and research, as well as public education and awareness. The Program's available total funding is $55 M over three years.